Rate Constants for Reactions of Phenoxyl Radicals in Solution

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Absolute rate constants for reactions of phenoxyl radicals in solution have been compiled and evaluated from the literature (172 citations). Rate constants are included for phenoxyl radicals bearing various substituents, including semiquinone radicals and radical ions, as well as aroxyl radicals derived from polycyclic aromatic compounds. The reactions tabulated include self-reactions of the radicals, reactions with other radicals, reactions with inorganic compounds, and reactions with organic compounds. A subset of the latter group includes electron transfer reactions for which the rate constants of both the forward and the reverse reaction have been measured. The radicals were generated by radiolysis, photolysis, thermolysis, or chemical reactions, and their rate constants were determined generally by kinetic spectrophotometry or electron spin resonance. © *2005 American Institute of Physics.* [DOI: 10.1063/1.1797812]

Key words: phenoxyl radicals; rate constants; reaction kinetics; semiquinone radicals

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1. Introduction

Phenols and quinones are found among hormones, vitamins, antibiotics, antioxidants, and other natural and commercial products. Phenoxyl and semiquinone radicals are formed in thermochemical, photochemical, radiation chemical, and biochemical processes which involve the oxidation of phenols or the reduction of quinones. Phenoxyl type radicals are involved in biological redox processes and in the biosynthesis of natural products. For these reasons, there has been much interest in the chemistry of phenoxyl radicals.[1–7] The rate constants for reactions of various radicals with phenols and quinones, which lead to the formation of phenoxyl and semiquinone radicals, were reported in previous compilations[8–11] and are available in the NDRL-NIST Solution Kinetics Database (http://kinetics.nist.gov/solution/index.php).

In this compilation we tabulate the absolute rate constants for reactions of phenoxyl radicals. The methods of production and monitoring of these radicals have been summarized in a recent chapter[7] and earlier reviews[1–6] and will not be repeated here. That chapter also discussed the chemical properties and reactions of phenoxyl radicals and presented selected rate constants. In this compilation we attempt to summarize all published absolute rate constants but do not include relative rate constants that have not been converted into absolute values by the original authors. The relative rate constants, as well as the absolute values reported through 1994 were summarized in the Landolt-Boernstein series.[12,13] The present compilation, which covers the literature through 2003, is presented in a more concise format and is also avail-

able in a searchable form as part of the NDRL-NIST Solution Kinetics Database.

Most of the rate constants tabulated in this compilation have been reported in only one study. In those cases where multiple determinations have been reported in the literature, the values are listed together, with no attempt to choose a preferred value or to average the listed values. In all of these cases, the different values appeared to have the same degree of validity since they were generally measured by the same approach. The standard uncertainties in the listed rate constants is generally between $\pm 10\%$ and $\pm 20\%$. When the uncertainty is larger the values are reported with an approximate sign ($\sim$). Some rate constants were reported with three significant figures, which is beyond the expected uncertainty in such measurements; those values are rounded to two significant figures.

Rate constants were not reported when the approach taken for their measurement was clearly incorrect. This was the case in several studies where second-order radical–radical rate constants were reported from measurements in which the solution contained more than one radical. For example, the decay of semiquinone radicals was followed by pulse radiolysis in aqueous solutions containing the quinone and t-BuOH.[14] In this case, the semiquinone radicals can decay by self-reaction and also by cross-reaction with the radicals derived from t-BuOH and thus the values reported for the self-reactions are in doubt. A similar situation existed in the measurement of semiquinone decay in the presence of EtOH[15] because the radical derived from EtOH does not reduce the quinone rapidly; these results also are not reported. In general, when 2-PrOH or formate ions were used as scavengers in pulse radiolysis experiments, it was assumed that the radicals produced from the reactions of these solutes with $H^{\cdot}$ atoms and $^{\cdot}OH$ radicals transfer an electron to the quinone and thus all the primary radicals of water radiolysis are converted into the semiquinone radical and the observed second-order decay can be ascribed to the self-reaction of the semiquinone radical. In this approach one neglects the small amount of beta-hydroxyalkyl radicals formed from 2-PrOH, which do not reduce the quinone rapidly. Similarly, when phenoxyl radicals are produced by oxidation of phenols in aqueous solutions containing bromide or azide ions and saturated with N_2O, one assumes complete conversion of primary radicals into phenoxyl radicals, although the small amount of $H^{\cdot}$ atoms formed by the radiolysis do not always lead to production of phenoxyl.

There are other cases of literature data not included in this compilation. For example, in one case,[16] the rate constants were given only in a graph on a logarithmic scale and it is not possible to tabulate the rate constants with a reasonable degree of uncertainty. In another case,[17] the rate constant of a reversible reaction in the reverse direction was reported along with the reduction potential difference between the two redox pairs; derivation of the rate constant for the forward reaction from such data will introduce a large uncertainty and thus was not reported. In two cases,[18,19] the experimental conditions were not specified and the approach taken was complex; the reported rate constants are not given in the present tables.

One-electron oxidation of phenols is known to take place much more slowly with neutral phenols than with the corresponding phenolate ions. Therefore, most electron transfer equilibrium reactions involving phenols were studied in alkaline solutions, where the phenols are ionized. Certain equilibrium studies, however, were carried out in neutral solutions and report very low rate constants for forward or reverse reactions with phenols ($<10^5$ L mol^{-1} s^{-1}). Such results are included in Table 9, but the reader is advised to take into account that the rapid reaction in one direction is likely to have a correct rate constant but the rate constant for the slow reaction in the opposite direction may be in doubt. In such cases, the equilibrium constant is also in doubt. This depends on the lifetime of the radicals involved in the electron transfer equilibrium and whether equilibrium is reached before the radicals decay to any significant extent.

2. Arrangement of the Tables

Table 1 summarizes the rate constants for the self-reactions of phenoxyl and semiquinone radicals. Self-reactions of radicals (R) are characterized by the formalism: $-d[R]/dt=2k[R]^2$ and values of $2k$ are tabulated. The radicals are presented in the following order:

phenoxyl
monosubstituted phenoxyl
- substituents bound through C
  - C–H and C–C only, ordered by increasing number of carbons
  - C–N (CN)
  - C–O (C–OH, C–OR, COOH, $CONH_2$, COOR, COR, CHO)
  - C–S
  - C–Halogen (F, Cl, Br, I)
- substituents bound through N (NH_2, NHR, NR_2, NHCOR, NO_2)
- substituents bound through O (OR, OOR, not OH)
- halogens (F, Cl, Br, I)

disubstituted phenoxyl
trisubstituted phenoxyl
tetrasubstituted phenoxyl
pentasubstituted phenoxyl
polycyclic aroxyl
heterocyclic aroxyl
- chromanoxyl and tocopheroxyl
- other heterocyclic oxyl

semiquinones (and hydroxyphenols).

In each of the above groups the same order of substitution and complexity is followed.

Table 2 summarizes the rate constants for reactions of phenoxyl radicals with other radicals. Reactions between two radicals, R_1 and R_2, are characterized by the formalism: $-d[R_1]/dt=-d[R_2]/dt=k[R_1][R_2]$ and values of k are tabulated. The table is organized by the type of the other reacting radical. First, the inorganic: $I^{\cdot}$, $O_2^{\cdot-}$, then the organic: carbon

centered radicals ($R^{\cdot}$), peroxyl radicals ($RO_2^{\cdot}$), phenoxyl radicals, ascorbate radical, nitroxides, diphenylpicrylhydrazyl (DPPH), other nitrogen and sulfur containing radicals. Within each type of the other radical, the phenoxyl radicals are ordered as in Table 1.

Table 3 summarizes the rate constants for reactions of phenoxyl radicals with inorganic compounds. It is arranged by the inorganic reactant in alphabetic order of the main element of this reactant (following the order used in previous compilations).[8–11] The inorganic reactants include, in this order: SCN^-, ClO_2^-, $Co(acac)_2$, Cu^{2+}, Fe ions, Fe complexes, ferrocenes, I^-, N_3^-, O_2, Rh ions, Ru ions, SO_3^{2-}, and VO. Within each inorganic reactant, the phenoxyl radicals are ordered as in Table 1.

The other tables summarize the rate constants for reaction of phenoxyl radicals with organic compounds. They are arranged by groups of reactants, except for reversible electron transfer reactions, which are presented in the last table. The arrangement is somewhat arbitrary and sometimes is governed by the type of information available for each group of compounds and an attempt to tabulate the available information in a space-saving manner.

Table 4 lists reactions of phenoxyl radicals with hydrocarbons, alcohols, olefins, fatty acid esters, in that order, with increasing complexity within each group. Table 5 lists reactions with amines, other nitrogen compounds, sulfur compounds. Table 6 lists reactions of phenoxyl radicals with phenols; it is arranged by increasing complexity of the reacting phenol: monohydroxybenzenes, dihydroxybenzenes, polyhydroxybenzenes, polycyclic phenols, heterocyclic phenols, within each group—by increasing complexity and for each reacting phenol the phenoxyl radicals are arranged by increasing complexity as in Table 1. Table 7 lists reactions with ascorbic acid and derivatives. Table 8 lists reactions with hydroperoxides and peroxides. Table 9 lists electron transfer equilibrium reactions where both the forward and the reverse reaction rate constants were reported. The first part of this table lists reactions in which phenoxyl or semiquinone radicals react as oxidants and the second part lists reactions in which semiquinone radicals react as reductants. This table is also arranged by increasing complexity of the molecular reactant and for each reactant by increasing complexity of the phenoxyl radical.

3. List of Abbreviations and Symbols

A	frequency factor
abs.	absorption
abstr.	abstraction
ABTS	2,2′-azinobis (3-ethylbenzothiazoline-6-sulfonate)
Ac	acetyl
acac	acetylacetonate
AcOH	acetic acid
alk.	alkaline
An	anthracene, substituted anthracene, anthryl
AQ	anthraquinone
AQS	anthraquinonesulfonate
$AscH_2$	ascorbic acid
BQ	benzoquinone
Bu	butyl
BuOH	butanol
t-BuOH	*tert*-butyl alcohol
t-Bu_2O_2	di-*tert*-butyl peroxide
BV^{2+}	benzyl viologen (1,1′-dibenzyl-4,4′-bipyridinium dication)
chem.	chemical
contg.	containing
CTAB	hexadecyltrimethylammonium bromide
CTAC	hexadecyltrimethylammonium chloride
detd.	determined
d.k.	decay kinetics
DMSO	dimethylsulfoxide
dopa	3,4-dihydroxyphenylalanine
dopamine	3,4-dihydroxyphenethylamine
DQ	duroquinone (tetramethyl-1,4-benzoquinone)
E_a	activation energy
EDTA	ethylenediaminetetraacetate
ESR	electron spin resonance
estd.	estimated
Et	ethyl
EtOH	ethanol
f.p.	flash photolysis
formn.	formation
ΔH	activation enthalpy
I	ionic strength
Ind	indole
J	joule (4.184 J = 1 cal)
K	equilibrium constant
k	rate constant
k_f	rate constant of the forward reaction
k_r	rate constant of the reverse reaction
Me	methyl
MeCN	acetonitrile
MeOH	methanol
MV^{2+}	methyl viologen (1,1′-dimethyl-4,4′-bipyridinium dication)
NAD^+	nicotinamide adenine dinucleotide
NADH	nicotinamide adenine dinucleotide, reduced
Np	naphthalene, substituted naphthalene, naphthyl
NQ	naphthoquinone
p.b.k.	product buildup kinetics
p.r.	pulse radiolysis
Ph	phenyl
PhCl	chlorobenzene
PhOH	phenol
phot.	photolysis
pK_a	negative logarithm of the acid dissociation constant ($AH + H_2O \rightleftharpoons A^- + H_3O^+$)
p.r.	pulse radiolysis
Pr	propyl
PrOH	propanol
Pz	promethazine

Q	quinone
redn.	reduction
rel.	relative
ΔS	activation entropy
satd.	saturated
SDS	sodium dodecylsulfate
s.f.	stopped-flow
soln.	solution
TEOA	triethanolamine
THF	tetrahydrofuran
TMPD	N,N,N′,N′-tetramethyl-*p*-phenylenediamine
Toc-OH	tocol, tocopherol
Trp	tryptophan
Tx-OH	Trolox C (6-hydroxy-2,5,7,8-tetramethylchroman-2-carboxylic acid)
Tyr	tyrosine

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TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt = 2k[R]^2$, values of $2k$ are tabulated)

No.	Phenoxyl structure or reaction	$2k$ ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	log $2A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
1	Phenoxyl									
	$C_6H_5O\cdot$	2.3×10^9	≈1	water	RT			p.r.	D.k. at 400 nm in deoxygenated aq. soln. contg. 0.1 mol L^{-1} H_2SO_4 and 0.01 mol L^{-1} phenol.	82TRI/SCH
		2.6×10^9	11	water	RT			p.r.	D.k. of the Raman peak nm in N_2O-satd. aq. soln. contg. 0.002 mol L^{-1} phenol.	84TRI/SCHa
	$C_6H_5O\cdot + C_6H_5O\cdot \rightarrow$ 4,4′-dihydroxybiphenyl, 2,4′-dihydroxybiphenyl, 2,2′-dihydroxybiphenyl		7.3–11.4	water	RT			p.r.	Product ratio 4,4′/2,4′/2,2′ = 1.0/1.7/0.7 in N_2O-satd. soln. contg. 0.01 mol L^{-1} phenol, w/wo 0.1 mol L^{-1} azide. Slight variations with conditions.	89YE/SCH
		5.6×10^8	8	water	285			f.p.	D.k. at 400 nm in deoxygenated soln.	73KHU/KUZ
2	2-Methylphenoxyl									
	2-$CH_3C_6H_4O\cdot$	3.2×10^8	8	water	285			f.p.	D.k. at 405 nm in deoxygenated soln.	73KHU/KUZ
		1.9×10^8	1.1	water	RT			f.p.	D.k. at 405 nm in deoxygenated soln.	78KHU/KUZ
3	3-Methylphenoxyl									
	3-$CH_3C_6H_4O\cdot$	2.8×10^9	alk.	water	290	13.9	25.1	p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	93ALF/SHO
		1.5×10^8	8	water	285			f.p.	D.k. at 420 nm in deoxygenated soln.	73KHU/KUZ
4	4-Methylphenoxyl									
	4-$CH_3C_6H_4O\cdot$	2.0×10^9	alk.	water	290	13.2	21.9	p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	93ALF/SHO
		2.2×10^8	8	water	285			f.p.	D.k. at 400 nm in deoxygenated soln.	73KHU/KUZ
5	4-(tert-Butyl)phenoxyl									
	4-$(CH_3)_3CC_6H_4O\cdot$	1.4×10^9	alk.	water	290	12.6	19.5	p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	93ALF/SHO
6	4-(2-Aminoethyl)phenoxyl (Tyramine phenoxyl)									
	4-$(H_2NCH_2CH_2)C_6H_4O\cdot$	4.7×10^8	11	water	RT			p.r.	D.k. at 400–410 nm in N_2O-satd. soln. contg. azide.	00DAL/BIA
7	Tyrosyl									
	TyrO·	8×10^8	7	water	RT			p.r.	D.k. at 405 nm in N_2O-satd. soln. contg. 1 mmol L^{-1} Tl_2SO_4 and 0.4 mmol L^{-1} tyrosine.	89HUN/DES
		4.5×10^8	9	water	RT			p.r.	D.k. at 405 nm in N_2O-satd. soln. contg. azide.	93JIN/LEI
8	4-(2-Hydroxyethyl)phenoxyl (Tyrosol phenoxyl)									
	4-$(HOCH_2CH_2)C_6H_4O\cdot$	1.0×10^9	11	water	RT			p.r.	D.k. at 400–410 nm in N_2O-satd. soln. contg. azide.	00DAL/BIA
9	4-Cyanophenoxyl									
	4-$NCC_6H_4O\cdot$	2.3×10^9	11	water	RT			p.r.	D.k. at 436 nm in N_2O-satd. soln. contg. azide.	00DAL/BIA
10	4-Aminophenoxyl									
	4-$H_2NC_6H_4O\cdot$	1.9×10^9	10.5	water				p.r.	D.k. at 440 nm in N_2O-satd. soln.	84TRI/SCHb
11	4-(Acetylamino)phenoxyl									
	4-$CH_3CONHC_6H_4O\cdot$	2.2×10^9	8.3	water	RT			p.r.	D.k. at 462 nm in N_2O-satd. soln.; k independent of ionic strength; k is the same at pH 7–10.5 but decreases at higher pH; at pH 12 k increases with ionic strength; radical has pK_a 11.1.	88BIS/TAB
12	3-Nitrophenoxyl									
	3-$O_2NC_6H_4O\cdot$	2.6×10^7	8	water	285			f.p.	D.k. at 450 nm in deoxygenated soln.	73KHU/KUZ

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt = 2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	log $2A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
13	3-Methoxyphenoxyl 3-$CH_3OC_6H_4O\cdot$	3.2×10^9	alk.	water	290	12.8	23.1	p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	93ALF/SHO
14	4-Methoxyphenoxyl 4-$CH_3OC_6H_4O\cdot$	1.0×10^9	alk.	water	290	12.9	21.9	p.r.	D.k. at 420 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	93ALF/SHO
15	4-Fluorophenoxyl 4-$FC_6H_4O\cdot$	2.5×10^9	alk.	water	290	12.1	14.9	p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	93ALF/SHO
16	4-Chlorophenoxyl 4-$ClC_6H_4O\cdot$	1.7×10^9	alk.	water	290	12.4	17.6	p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	93ALF/SHO
17	4-Bromophenoxyl 4-$BrC_6H_4O\cdot$	1.3×10^9	alk.	water	290	12.3	16.2	p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	93ALF/SHO
18	4-Iodophenoxyl 4-$IC_6H_4O\cdot$	1.1×10^9	9	water	RT			f.p.	D.k. at 420 nm in aerated soln. contg. 4-iodophenol and anthraquinone-2,6-disulfonate.	74KHU/KUZ
19	2,6-Dimethylphenoxyl 2,6-$(CH_3)_2C_6H_3O\cdot$	4.2×10^9	5.8	water	RT			p.r.	D.k. at 375 and 390 nm in N_2O-satd. soln. contg. azide.	95TER/SER
20	3,4-Dimethylphenoxyl 3,4-$(CH_3)_2C_6H_3O\cdot$	1.5×10^9	5.8	water	RT			p.r.	D.k. at 400 and 415 nm in N_2O-satd. soln. contg. azide.	95TER/SER
21	2,6-Di(tert-Butyl)phenoxyl 2,6-$(t\text{-}Bu)_2C_6H_3O\cdot$	3.8×10^8		1,2-epoxybutane	294	10.1	8.5	photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide.	88RUE/FIS
		4.6×10^8		n-heptane	293	10.2	8.8	photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide.	88RUE/FIS
		9.6×10^8		MeCN	295	9.9	4.9	photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide.	88RUE/FIS
		2.7×10^8		t-Bu-benzene	294	10.7	12.5	photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide.	88RUE/FIS
		2.0×10^8		3-Me-3-pentanol	296	11.2	16.2	photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide.	88RUE/FIS
		3.0×10^8		2-PrOH	275	10.5	10.5	photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide.	88RUE/FIS
		2.9×10^8		benzene	RT			photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide. Addition of p-toluene sulfonic acid did not affect k.	88RUE/FIS

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ (L mol^{-1} s^{-1})	pH	Solvent	T (K)	log $2A$	E_a (kJ mol^{-1})	Method	Comments	Reference
22	3,4-Dimethoxyphenoxyl 3,4-$(CH_3O)_2C_6H_3O$·	1.3×10^9	3–14	water	293			p.r.	D.k. at 430 nm in N_2O-satd. soln.	91JOV/TOS
23	3,5-Dimethoxyphenoxyl 3,5-$(CH_3O)_2C_6H_3O$·	1.3×10^9	3–14	water	293			p.r.	D.k. at 505 nm in N_2O-satd. soln.	91JOV/TOS
24	3,4-Methylenedioxyphenoxyl (Sesamoxyl) sesamol-O·	5.0×10^8	3–14	water	293			p.r.	D.k. at 435 nm in N_2O-satd. soln.	91JOV/TOS
25	2,4-Dibromophenoxyl 2,4-$Br_2C_6H_3O$·	2.0×10^8	8	water	285			f.p.	D.k. at 420 nm in deoxygenated soln.	73KHU/KUZ
26	2,4,6-Trimethylphenoxyl 2,4,6-$Me_3C_6H_2O$·	4×10^7		benzene	343			therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
27	2-tert-Butyl-4,6-diethylphenoxyl 2-t-Bu-4,6-$Et_2C_6H_2O$·	2.8×10^5		benzene	323	8.56	19	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
28	2,6-Di-tert-butyl-4-methylphenoxyl 2,6-$(t\text{-}Bu)_2$-4-MeC_6H_2O· +2,6-$(t\text{-}Bu)_2$-4-MeC_6H_2 O·→dimer	8.7×10^3		benzene	323	7.17	20	therm.	Steady-state ESR signal in deoxygenated soln. contg. the phenol and dicyclohexylperoxy dicarbonate.	85ROG
		1.8×10^8		n-heptane	254	10.1	8.9	photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide. For reverse reaction $k_r=2.4$ s^{-1}, log $A=15.1$, $E_a=72$	88RUE/FIS
		1.3×10^8		3-Me-3-pentanol	265	13.0	25.1	photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide. For reverse reaction $k_r=3.9$ s^{-1}, log $A=19$, $E_a=93$	88RUE/FIS
		8.7×10^7		t-Bu-benzene	260	11.3	16.6	photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide. For reverse reaction $k_r=5.1$ s^{-1}, log $A=16.8$, $E_a=80$	88RUE/FIS
		3.1×10^7		di-n-butyl phthalate	275	11.3	20	photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide. For reverse reaction $k_r=9.8$ s^{-1}, log $A=25$, $E_a=126$	88RUE/FIS
		2.6×10^8		MeCN	263	8.9	2.7	photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide. For reverse reaction $k_r=8.4$ s^{-1}, log$A=16.8$, $E_a=80$	199RUE/FIS
		1.1×10^8		1,2-epoxybutane	255	9.6	7.8		photoKinetic ESR (rotating sector in soln. contg. di-t-butyl peroxide. For reverse reaction kr=2.8 s−1, log$A=17.0$, $E_a=81$	88RUE/FIS

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	log $2A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
		1.7×10^8		1,2-epoxybutane	298			photo.	Kinetic ESR (rotating sector in soln. contg. di-t-butyl peroxide.	89RUE/FIS
		$\approx1\times10^8$		n-heptane	298			photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide.	89RUE/FIS
	4-CH_3-2,6-(t-Bu)$_2C_6H_2O\cdot\rightarrow CH_2$-2,6-(t-Bu)$_2C_6H_2OH$	$4\times10^4\ s^{-1}$		cyclohexane		RT		p.r.	D.k. at 305 nm in deoxygenated soln.	91BRE/WOJ
29	2,6-Di-tert-butyl-4- ethylphenoxyl 2,6-(t-Bu)$_2$-4-Et$C_6H_2O\cdot$	2.4×10^3		benzene	323	7.58	26	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
30	2,6-Di-tert-butyl-4-isopropylphenoxyl 2,6-(t-Bu)$_2$-4-(i-Pr)$C_6H_2O\cdot$	1.8		benzene	293			chem.	Kinetic ESR in deaerated soln. contg. DPPH radicals and the phenol.	67AYS/RUS
		7.7		benzene	323	6.23	33	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
31	4-Methyl-2,6-di-tert-pentylphenoxyl 4-Me-2,6-(CMe_2Et)$C_6H_2O\cdot$	2.4×10^3		benzene	323	6.95	23	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
32	2,6-Di-tert-butyl- 4-(2′-hydroxyethyl)phenoxyl 2,6-(t-Bu)$_2$-4-($HOCH_2CH_2$)$C_6H_2O\cdot$	1.1×10^3		benzene	323	7.27	26.3	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
33	2,6-Di-tert-butyl-4-(methoxymethyl)phenoxyl 2,6-(t-Bu)$_2$-4-($MeOCH_2$)$C_6H_2O\cdot$	1.1×10^2		benzene	323	7.18	32			
34	2,4,6-tri-tert-butylphenoxyl 2,4,6-(t-Bu)$_3C_6H_2O\cdot$	$<1\times10^{-5}$		benzene	323			therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
35	2,6-Di-tert-butyl-4-cyclohexylphenoxyl 2,6-(t-Bu)$_2$-4-(c-Hx)$C_6H_2O\cdot$	1.1×10^1		benzene	323	5.24	26	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
36	2,6-Dicyclohexyl-4-phenylphenoxyl 2 2,6-(c-C_6H_{11})$_2$-4-Ph-$C_6H_2O\cdot\rightarrow$dimer	2.7×10^7		n-PrOH	293			f.p.	D.k. at 510 nm. $k_r=1\times10^3\ s^{-1}$. $K=(4\pm2)\times10^{-5}$.	79KUZ/KHU
37	2,4,6-Triphenylphenoxyl 2 2,4,6-Ph_3-$C_6H_2O\cdot\rightarrow$ dimer	8×10^7		n-PrOH	293			f.p.	D.k. at 550 or 750 nm. $k_r=3\times10^3\ s^{-1}$. $K=(4\pm2)\times10^{-5}$.	79KUZ/KHU
38	2,6-Di-tert-butyl-4-(methoxycarbonylethyl)phenoxyl									

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ (L mol^{-1} s^{-1})	pH	Solvent	T (K)	log $2A$	E_a (kJ mol^{-1})	Method	Comments	Reference
	2,6-(t-Bu)$_2$-4-(CH$_3$OCOCH$_2$CH$_2$)C$_6$H$_2$O·	7.4×10^2		benzene	323	7.27	27	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
39	2,6-Di-tert-butyl-4-(octadecyloxycarbonylethyl)phenoxyl									
	2,6-(t-Bu)$_2$-4-(C$_{18}$H$_{37}$OCOCH$_2$CH$_2$)C$_6$H$_2$O·	4.2×10^2		benzene	299	7.66	29	chem.	Decay of ESR signal in deoxygenated soln. contg. d i-tert-butyl peroxide. Phenoxyl radical formed by photolysis in the ESR cavity and the kinetics followed after termination of photolysis.	85YAR/ROG
		1.5×10^3		benzene	323	6.48	20.5	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
40	2,6-Di-tert-butyl-4-(3′,5′-di-tert-butyl-4′-hydroxyphenyl)phenoxyl									
	2,6-(t-Bu)$_2$-4-(3′,5′-(t-Bu)$_2$-4′-HOC$_6$H$_2$)-C$_6$H$_2$O·	1.4×10^9		AcOH	296			f.p.	D.k. at 650 nm.	78KHU/BUR
		7×10^8		formic acid	296			f.p.	D.k. at 650 nm.	78KHU/BUR
		1.3×10^6		toluene	193–233		≈0	f.p.	D.k. of UV-vis abs. in deoxygenated soln.	83TUM/PRO
41	2,4-Di-tert-butyl-6-(3′,5′-di-tert-butyl-2′-hydroxyphenyl)phenoxyl									
	2,4-(t-Bu)$_2$-6-(3′,5′-(t-Bu)$_2$-2′-HOC$_6$H$_2$)C$_6$H$_2$O·	1.4×10^1		benzene	299	8.91	39	chem.	Decay of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide. Phenoxyl radical formed by photolysis in the ESR cavity and the kinetics followed after termination of photolysis.	85YAR/ROG
42	2,6-Di-tert-butyl-4-(3′,5′-di-tert-butyl-4′-hydroxyphenyl)methylphenoxyl									
	2,6-(t-Bu)$_2$-4-(3′,5′-(t-Bu)$_2$-4′-HOC$_6$H$_2$CH$_2$)C$_6$H$_2$O·	3.5×10^2		benzene	299	7.13	26	chem.	Decay of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide. Phenoxyl radical formed by photolysis in the ESR cavity and the kinetics followed after termination of photolysis.	85YAR/ROG
43	2,4-Di-tert-butyl-6-(3′,5′-di-tert-butyl-2′-hydroxyphenyl)methylphenoxyl									
	2,4-(t-Bu)$_2$-6-(3′,5′-(t-Bu)$_2$-2′-HOC$_6$H$_2$CH$_2$)C$_6$H$_2$O·	4.6×10^1		benzene	299	7.87	36	chem.	Decay of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide. Phenoxyl radical formed by photolysis in the ESR cavity and the kinetics followed after termination of photolysis.	85YAR/ROG

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	log $2A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
		2.4×10^2		benzene	323	8.64	38.8	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
44	2-tert-Butyl-4-methyl-6-(3′-tert-butyl-5′-methyl-2′-hydroxyphenyl)methylphenoxyl									
	2-(t-Bu)-4-Me-6-(3′-(t-Bu)-5′-Me-2′-$HOC_6H_2CH_2$) $C_6H_2O\cdot$	5×10^6		benzene	343			therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
45	2,6-Di-tert-butyl-4-(4′-hydroxy-3′,5′-di-tert-butylphenylmethyl)phenoxyl									
	$HOC_6H_2(t\text{-}Bu)_2CH_2C_6H_2(t\text{-}Bu)_2\text{-}O\cdot$	3.1×10^3		benzene	323	6.48	18.5	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
46	2-tert-Butyl-4-methyl-6-(2′-methoxy-3′-tert-butyl-5′-methylphenylmethyl)phenoxyl									
	$MeOC_6H_2(t\text{-}Bu)(Me)CH_2C_6H_2(t\text{-}Bu)\times(Me)-O\cdot$	5×10^6		benzene	343			therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
47	4,6-Di-tert-butyl-2-(2′-methoxy-3′,5′-di-tert-butylphenylethyl)phenoxyl									
	$MeOC_6H_2(t\text{-}Bu)_2CH_2CH_2C_6H_2(t\text{-}Bu)_2-O\cdot$	3.0×10^3		benzene	323			therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
48	2,6-Di-tert-butyl-4-(tris(3′,5′-di-tert-butyl-4′-hydroxyphenylpropanoyloxy-methyl)ethyloxycarbonylethyl)phenoxyl									
	$(HOC_6H_2(t\text{-}Bu)_2CH_2CH_2COOCH_2)_3CCH_2OCOCH_2CH_2C_6H_2(t\text{-}Bu)_2-O\cdot$	5.5×10^2		benzene	299	6.98	24	chem.	Decay of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide. Phenoxyl radical formed by photolysis in the ESR cavity and the kinetics followed after termination of photolysis.	85YAR/ROG
		2.4×10^3		benzene	323	5.89	15.5	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
49	2,6-Di-tert-butyl-4-(2′,4′,6′-trimethyl-3′,5′-di(4″-hydroxy-3″,5″-di-tert-butylphenylmethyl))methylphenoxyl									
	$(HOC_6H_2(t\text{-}Bu)_2CH_2)_2-Me_3-C_6H_2CH_2C_6H_2(t\text{-}Bu)_2-O\cdot$	1×10^2		benzene	323	7.16	33	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
50	2-tert-Butyl-6-methyl-4-(4′-hydroxy-3′-methyl-5′-tert-butylphenylpropanoylethyloxyethyloxycarbonylethyl)phenoxyl									
	$HOC_6H_2(t\text{-}Bu)(Me)CH_2CH_2COOCH_2CH_2OCH_2CH_2OCOCH_2CH_2C_6H_2(Me)(t\text{-}Bu)\text{-}O\cdot$	2.4×10^5		benzene	323	7.63	14	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate	85ROG
51	2,6-Di-tert-butyl-4-(4′-hydroxy-3′,5′-di-tert-butylphenylpropanoylethyloxyethyloxycarbonylethyl)phenoxyl									
	$HOC_6H_2(t\text{-}Bu)_2CH_2CH_2COOCH_2CH_2OCH_2CH_2OCOCH_2CH_2C_6H_2(t\text{-}Bu)_2\text{-}O\cdot$	1.8×10^3		benzene	323	7.06	24	therm.	Steady-state ESR signal in deoxygenated soln. contg. dicyclohexylperoxy dicarbonate.	85ROG
52	2,6-Diphenyl-4-(3′,5′-diphenyl-4′-hydroxyphenyl)phenoxyl									

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ (L mol^{-1} s^{-1})	pH	Solvent	T (K)	log $2A$	E_a (kJ mol^{-1})	Method	Comments	Reference
	2,6-Ph_2-4-(3′,5′-Ph_2-4′-HOC_6H_2)C_6H_2O·	1.3×10^5		toluene	296			f.p.	D.k. of the ESR signal. Radical formed by photolysis of soln. contg. the phenol and the corresponding quinone.	78KHU/BUR
53	4-Methoxy-2,6-diphenylphenoxyl 2 4-MeO-2,6-Ph_2-C_6H_2O· → dimer	7×10^8		n-PrOH	293			f.p.	D.k. at 650 nm. $k_r=3\times10^2$ s^{-1}. $K=(4\pm1)\times10^{-7}$. $\Delta H^{\ddagger}=(21\pm4)$ kJ mol^{-1}, $\Delta S^{\ddagger}=(0\pm12)$ J mol^{-1} K^{-1}.	79KUZ/KHU
54	4-Ethoxy-2,6-diphenylphenoxyl 2 4-EtO-2,6-Ph_2-C_6H_2O· → dimer	3.5×10^8		n-PrOH	293			f.p.	D.k. at 650 nm. $k_r=1\times10^3$ s^{-1}. $K=(3\pm1)\times10^{-6}$. $\Delta H^{\ddagger}=(17\pm4)$ kJ mol^{-1}, $\Delta S^{\ddagger}=-(21\pm12)$ J mol^{-1} K^{-1}.	79KUZ/KHU
55	4-Octadecyloxy-2,6-diphenylphenoxyl 2 4-n-$C_{18}H_{37}O$-2,6-Ph_2-C_6H_2O· → dimer	1.9×10^8		n-PrOH	293			f.p.	D.k. at 650 nm. $k_r=1\times10^3$ s^{-1}. $K=(5\pm1)\times10^{-6}$. $\Delta H^{\ddagger}=(17\pm4)$ kJ mol^{-1}, $\Delta S^{\ddagger}=-(25\pm12)$ J mol^{-1} K^{-1}.	79KUZ/KHU
56	3,4,5-Trimethoxyphenoxyl 3,4,5-$(CH_3O)_3C_6H_2O$·	1.3×10^9	3–14	water	293			p.r.	D.k. at 495 nm in N_2O-satd. soln.	91JOV/TOS
57	2,4,5-Trichlorophenoxyl 2,4,5-$Cl_3C_6H_2O$·	1.5×10^9	10	water	RT			p.r.	D.k. at 430 nm in N_2O-satd. soln. contg. azide.	89DRA/FOX
58	4-Methoxy-2,3,5,6-tetramethylphenoxyl 4-$(CH_3O)C_6(CH_3)_4O$·	6×10^4		benzene	296			photo.	D.k. of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide. No effect of O_2.	85BUR/DOB
59	Pentachlorophenoxyl C_6Cl_5O·	1.8×10^9	8	water	RT			p.r.	D.k. at 440 nm in N_2O-satd. soln. contg. azide.	91TER/SER
60	Pentabromophenoxyl C_6Br_5O·	5.6×10^9	8	water	RT			p.r.	D.k. at 350 and 470 nm in N_2O-satd. soln. contg. azide.	91TER/SER
61	2,2,5,7,8-Pentamethylchroman-6-oxyl PMC–O·	3×10^3		benzene	296			photo.	D.k. of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide. No effect of O_2.	85BUR/DOB
		2.2×10^3		benzene	323	8.12	29.7	therm.	Steady-state ESR signal in deoxygenated soln. contg. the phenol and di-tert-butyl hyponitrite.	87ROG/KRA

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	log $2A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
		8.9×10^2		PhCl	310			therm.	Radicals generated by reaction with di-tert-butylhyponitrite or 2,2′-azobis(2,4-dimethylvaleronitrile). Monitored absorbance at 424 nm vs 440 nm. Detd. also from decay of PMC-O· after fast reaction of PMCO with DPPH·.	95BOW/ING
		1.1×10^3		EtOH	310			Chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
62	2-Carboxy-2,5,7,8-tetramethylchromane-6-oxyl (Trolox phenoxyl radical)									
	TxO·	1.6×10^7	4.5	water	RT			p.r.	D.k. at 440 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} Na_2SO_4, 0.01 mol L^{-1} Br^-, and 0.16 mmol L^{-1} Trolox.	86CAB/BIE
		4.2×10^6	5.1							
		2.1×10^6	5.3							
		1.9×10^6	5.4							
		3.6×10^5	5.7							
63	5,7-Dimethyltocoxyl									
	DMToc-O·	4.5×10^3		benzene	296			photo.	D.k. of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide.	85BUR/DOB
64	α-Tocopheroxyl									
	α-Toc-O·	3×10^3		benzene	296			f.p.	Kinetic ESR in soln. contg. 9% di-t-butyl peroxide. No effect of O_2.	84DOB/BUR 85BUR/DOB
		1.0×10^4		benzene	299	7.73	21	chem.	Decay of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide. Phenoxyl radical formed by photolysis in the ESR cavity and the kinetics followed after termination of photolysis.	85YAR/ROG
		1.4×10^3		EtOH	293	8.2	27.6	chem.	Kinetic ESR. Radical produced by reaction of tocopherol with DPPH.	88ROU/RIC
		5.6×10^2		heptanol	293	6.1	18.0	chem.	Kinetic ESR. Radical produced by reaction of tocopherol with DPPH. Paper quotes $2k=1.9\times10^2$ in chloroform and various values in benzene.	88ROU/RIC
		3×10^3		n-BuOH				chem.	Decay of ESR signal, radical produced by reaction of α-tocopherol with DPPH.	93OND/MIS
	α-Toc-O· + α-Toc-O· →dimer	1.1×10^2		benzene	298			f.p.	Kinetic ESR in soln. contg. di-t-butyl peroxide. $k_r=2\times10^{-2}\ s^{-1}$.	94LUC/PED
	α-Toc-O· + α-Toc-O· → disproportionation	6×10^3		benzene	298			f.p.	Kinetic ESR in soln. contg. di-t-butyl peroxide.	94LUC/PED

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ (L mol^{-1} s^{-1})	pH	Solvent	T (K)	log $2A$	E_a (kJ mol^{-1})	Method	Comments	Reference
		8.6×10^2		PhCl	298	7.4	25.5	therm.	Radicals generated by reaction of di-tert-butylhyponitrite or 2,2′-azobis(2,4-dimethylvaleronitrile). Monitored absorbance at 424 nm vs 440 nm. Cor. for reaction with impurity. Detd. also from the decay of αToc-O· after fast reaction of α-tocopherol with DPPH·. Deuteration of α-tocopherol (5-CD_3 or 5,7-$(CD_3)_2$) reduces $2k$ by a factor of 3.7.	95BOW/ING
		1.0×10^3		EtOH	310			chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
65	β-Tocopheroxyl									
	β-Toc-O·	4×10^4		benzene	296			photo.	D.k. of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide. No effect of O_2.	85BUR/DOB
66	γ-Tocopheroxyl									
	γ-Toc-O·	4.5×10^4		benzene	296			photo.	D.k. of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide.	85BUR/DOB
67	δ-Tocopheroxyl									
	δ-Toc-O·	1.5×10^5		benzene	296			photo.	D.k. of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide. Little effect of O_2.	85BUR/DOB
68	2,3-Dihydro-2,2,4,6-tetramethylbenzofuran-5-oxyl									
	BOM–O·	7.0×10^2		EtOH	310			Chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
69	2,3-Dihydro-2,2-dimethyl-4,6-di-tert-butylbenzofuran-5-oxyl									
	BOB–O·	1.1		EtOH	310			Chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
70	2,3-Dihydro-2,2-dipentyl-4,6-di-tert-butylbenzofuran-5-oxyl									
	BO–653-O·	1.1		EtOH	310			Chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
71	2,3-Dihydro-2,4,6,7-tetramethylbenzofuran-5-oxyl									
	TMBF–O·	4×10^3		benzene	296			photo.	D.k. of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide.	85BUR/DOB
72	5,7,8-Trimethyl-3,4-dihydrobenzothiopyran-6-oxyl									
	TMTP–O·	2×10^2		benzene	296			photo.	D.k. of ESR signal in deoxygenated soln. contg. di-tert-butyl peroxide. $k=7\times10^2$ in the presence of O_2.	85BUR/DOB

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

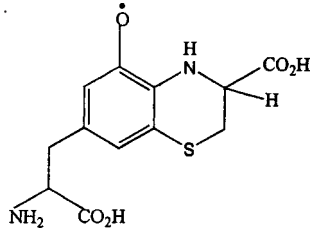
No.	Phenoxyl structure or reaction	$2k$ ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	log $2A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
73	7-(2-Amino-2-carboxyethyl)-3-carboxy-3,4-dihydro-2H-1,4-benzothiazine-5-oxyl									
	BT-O· 	2.7×10^7	7.0	water	RT			p.r.	D.k. at 330 nm in N_2O-satd. soln. contg. bromide.	99NAP/DID
74	1,2-Benzosemiquinone									
	1,2-$C_6H_4(OH)O$·	3.9×10^8	2.0	water	RT			f.p.	D.k. at 350 nm in deoxygenated soln.	78KHU/KUZ
75	1,2-Benzosemiquinone anion									
	1,2-$C_6H_4(O^-)O$·	1.1×10^7	7.0	water	RT			p.r.	D.k. at 300 nm in N_2O-satd. soln. contg. azide. Decay mostly via 2-$(O^-)C_6H_4O$· + 2-$(OH)C_6H_4O$ ·.	93LAN
76	4-t-Butyl-1,2-benzosemiquinone									
	4-t-Bu-1,2-$C_6H_3(OH)O$·	9.0×10^8	3.0	water	RT			p.r.	D.k. at 310 nm in N_2O-satd. soln.	79RIC
77	4-t-Butyl-1,2-benzosemiquinone anion									
	4-t-Bu-1,2-$C_6H_3(O^-)O$·	4×10^6	7.3	water	RT			p.r.	D.k. at 310 nm in N_2O-satd. soln., $2k$ is upper limit for decay of semiquinone anion, observed decay involves also neutral semiquinone ($pK_a=5.2$). $k=1.2\times10^9$ estd. for the mixed decay of neutral and anion.	79RIC
78	Dopa semiquinone anion									
	Dopa$(O^-)O$·	9.8×10^7	7.7	water	RT			p.r.	D.k. at 305 nm in N_2O-satd. soln. contg. azide.	85THO/LAN
79	4-Methoxy-1,2-benzosemiquinone anion									
	4-(CH_3O)-1,2-$C_6H_3(O^-)O$·	2.5×10^8	7.0	water	RT			p.r.	D.k. at 320 nm in N_2O-satd. soln. contg. azide.	87COO/LAN
80	3,5-Di-tert-butyl-1,2-benzosemiquinone									
	3,5-$(t\text{-}Bu)_2$-1,2-$C_6H_2(OH)O$·	6.0×10^6		toluene	193–233		≈0	f.p.	D.k. of UV-vis abs. in deoxygenated soln. Kinetic isotope effect $k_H/k_D=12.5$ for deuteriated OH group.	83TUM/PRO
81	3,6-Di-tert-butyl-1,2-benzosemiquinone									
	3,6-$(t\text{-}Bu)_2$-1,2-$C_6H_2(OH)O$·	1×10^7		toluene	RT			photo.	D.k. of UV-vis abs	75TUM/PRO
		2.2×10^6		toluene	193–233		≈0	f.p.	D.k. of UV-vis abs. in deoxygenated soln. Kinetic isotope effect $k_H/k_D=14.5$ for deuteriated OH group.	83TUM/PRO
82	2-S-Cysteinyldopa semiquinone anion									

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt = 2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ (L mol^{-1} s^{-1})	pH	Solvent	T (K)	log $2A$	E_a (kJ mol^{-1})	Method	Comments	Reference
	2-S-Cysteinyldopa(O^-)O·	8.8×10^7	7	water	RT			p.r.	D.k. at 320 nm in N_2O-satd. soln. contg. azide.	85THO/LAN
83	5-S-Cysteinyldopa semiquinone anion									
	5-S-Cysteinyldopa(O^-)O·	1.8×10^8	7	water	RT			p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. azide.	85THO/LAN
		1.7×10^8	7.0	water	RT			p.r.	D.k. at 320 nm in N_2O-satd. soln. contg. bromide.	99NAP/DID
84	2,5-Di(S-cysteinyl)dopa semiquinone anion									
	2,5-Di(S-cysteinyl)dopa(O^-)O·	1.1×10^8	7	water	RT			p.r.	D.k. at 340 nm in N_2O-satd. soln. contg. azide.	85THO/LAN
85	3-tert-Butyl-5-triphenylmethyl-1,2-benzosemiquinone									
	3-t-Bu-5-(Ph_3C)-1,2-C_6H_2(OH)O·	5.5×10^6		toluene	193–233		≈0	f.p.	D.k. of UV-vis abs. in deoxygenated soln. Kinetic isotope effect $k_H/k_D = 23$ for deuteriated OH group.	83TUM/PRO
86	3,5-Di-tert-butyl-6-chloro-1,2-benzosemiquinone									
	3,5-$(t\text{-}Bu)_2$-6-Cl-1,2-C_6H(OH)O·	5.6×10^6		toluene	193–233		≈0	f.p.	D.k. of UV-vis abs. in deoxygenated soln. Kinetic isotope effect $k_H/k_D = 8.6$ for deuteriated OH group.	83TUM/PRO
87	Pyrogallol semiquinone anion									
	1,2,3-C_6H_3(OH)(O^-)O·	3.0×10^8	6.7	water	RT			p.r.	D.k. at 300 nm in N_2O-satd. soln. contg. bromide.	88DEE/PAR
88	n-Propyl gallate semiquinone anion									
	3,4,5-(OH)(O^-)(O·)$C_6H_2CO_2C_3H_7$	8.0×10^8	6.7	water	RT			p.r.	D.k. in N_2O-satd. soln. contg. bromide.	88DEE/PAR
89	1,3-Benzosemiquinone (3-hydroxyphenoxyl)									
	1,3-C_6H_4(OH)O·	3.5×10^9	2.0	water	RT			f.p.	D.k. at 420 nm in deoxygenated soln.	78KHU/KUZ
90	5-Methyl-1,3-benzosemiquinone									
	5-(CH_3)-1,3-C_6H_3(OH)O·	3.5×10^9	2.0	water	RT			f.p.	D.k. at 450 nm in deoxygenated soln.	78KHU/KUZ
91	Phloroglucinol semiquinone									
	1,3,5-$C_6H_3(OH)_2$O·	1.7×10^9	2.5	water	RT			p.r.	D.k. at 495 nm in N_2O/O_2-satd. soln.	94WAN/GYO
92	1,4-Benzosemiquinone									
	1,4-C_6H_4(OH)O·	2.7×10^8		EtOH	293			f.p.	D.k. of ESR signal in deoxygenated soln.	73AYS/SEA
		1.9×10^8		2-PrOH	293			f.p.	D.k. of ESR signal in deoxygenated soln.	73AYS/SEA
		1.5×10^9		2-PrOH	293	11.8	15.5	photo.	D.k. of ESR signal in deoxygenated soln.	72WON/SYT
		1.7×10^8		2-BuOH	293			f.p.	D.k. of ESR signal in deoxygenated soln.	73AYS/SEA
		1.6×10^8		2-Me-1-PrOH	293			f.p.	D.k. of ESR signal in deoxygenated soln.	73AYS/SEA

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ (L mol^{-1} s^{-1})	pH	Solvent	T (K)	log $2A$	E_a (kJ mol^{-1})	Method	Comments	Reference
		1.7×10^8		benzyl alcohol	293			f.p.	D.k. of ESR signal in deoxygenated soln.	73AYS/SEA
		5.4×10^9		dioxane	293	12.6	16.3	photo.	D.k. of ESR signal in deoxygenated soln.	72WON/SYT
		7.3×10^8	acid	MeOH	RT			p.r.	D.k. at 410 nm in deoxygenated soln. contg. 0.01 mol L^{-1} H_2SO_4.	70LAN/SWA
		1.1×10^9	2	water	RT			p.r.	D.k. at 410 nm in deoxygenated soln.	67ADA/MIC
		7.3×10^8	acid	MeOH	RT			p.r.	D.k. at 410 nm in deoxygenated soln. contg. 0.01 mol L^{-1} H_2SO_4.	70LAN/SWA
		1.1×10^9	2	water	RT			p.r.	D.k. at 410 nm in deoxygenated soln.	67ADA/MIC
		7×10^8	2.4	water	298			f.p.	D.k. at 425 nm in deoxygenated soln., $2k=1.7\times10^7$ in 10% sodium dodecylsulfate and 3.4×10^6 in 10% Tween-80.	72DAV/GOL
		1.8×10^9	0	water/2-PrOH	293			f.p.	D.k. at 415 nm in deoxygenated soln. contg. 10% 2-PrOH. $\Delta H=5.4$ kJ mol^{-1}, $\Delta S=-50$ J K^{-1} mol^{-1}.	75KUZ/DAV
		1.2×10^9	2.6	water/2-PrOH	RT			p.r.	D.k. at 410 nm in deoxygenated soln. contg. (1–3) mol L^{-1} 2-PrOH.	73RAO/HAY
		3.5×10^8		2-PrOH/toluene	293	11.4	16	photo.	D.k. (rotating sector) of ESR signal in deoxygenated soln. contg. 15% toluene and the quinone.	78ELL/EGA
		1.1×10^9	1.7	water	RT			p.r.	D.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} 2-PrOH.	94SHO/MIT
93	1,4-Benzosemiquinone anion 1,4-$C_6H_4(O^-)O\cdot$	1.7×10^8	7	water	RT			p.r.	D.k. at 430 nm in deoxygenated soln.	67ADA/MIC
		1.2×10^8	4.6	water/2-PrOH	293			f.p.	D.k. at 425 nm in deoxygenated soln. contg. 10% 2-PrOH. Decay mainly via 4-$(O^-)C_6H_4O\cdot$ + 4-$(HO)C_6H_4O\cdot$. $\Delta H=25.5$ kJ mol^{-1}, $\Delta S=-4.2$ J K^{-1} mol^{-1}.	75KUZ/DAV
		5.5×10^7	9.2	water/2-PrOH	RT			p.r.	D.k. at 430 nm in deoxygenated soln. contg. (1–3) mol L^{-1} 2-PrOH. Decay includes reaction with the protonated radical. $pK_a=4.0$ for semiquinone radical.	73RAO/HAY
		1.2×10^8	7.0	water	RT			f.p.	D.k. at 425 nm in deoxygenated soln. Decay involves reaction also with neutral semiquinone.	78KHU/KUZ
		1.8×10^9	1.1	water	RT			f.p.	D.k. at 415 nm in deoxygenated soln.	78KHU/KUZ

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ (L mol^{-1} s^{-1})	pH	Solvent	T (K)	log $2A$	E_a (kJ mol^{-1})	Method	Comments	Reference
		8.5×10^7	5.5	water	RT			p.r.	D.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} 2-PrOH.	94SHO/MIT
94	2-Methyl-1,4-benzosemiquinone 2-(CH_3)-1,4-$C_6H_3(OH)O\cdot$	1.6×10^9		toluene/2-PrOH	293	11.7	14	photo.	D.k. (rotating sector) of ESR signal in deoxygenated soln. contg. 10% 2-PrOH, 0.1 mol L^{-1} 2-methylhydroquinone, and the quinone.	78ELL/EGA
95	2-tert-Butyl-1,4-benzosemiquinone 2-(t-Bu)-1,4-$C_6H_3(OH)(O\cdot)$	1.3×10^9	<4	water	295			p.r.	D.k. at 411 nm in N_2-satd. soln. contg. 2-PrOH and acetone. Rate constants are reported also for the radical anion and for the radical +radical anion from pH dependence but values may be affected by reactions with the radical derived from t-BuOH.	95DOH/BER
96	2-Carboxymethyl-1,4-benzosemiquinone anion 2,5-$(O^-)(O\cdot)C_6H_3CH_2CO_2^-$	6.8×10^7	11.5	water	RT			p.r.	D.k. at 315 nm in N_2O-satd. soln.	87ERB/BOR
97	2,5-Dimethyl-1,4-benzosemiquinone anion 2,5-$(CH_3)_2$-1,4-$C_6H_2(O^-)O\cdot$	1.2×10^8	7.2	water	RT			p.r.	D.k. at 435 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH and 0.01 mol L^{-1} acetone.	82SUT/SAN
98	2,6-Dimethyl-1,4-benzosemiquinone 2,6-$(CH_3)_2$-1,4-$C_6H_2(OH)O\cdot$	1.4×10^9		2-PrOH/toluene	293	10.9	10	photo.	D.k. (rotating sector) of ESR signal in deoxygenated soln. contg. 15% toluene, 0.1 mol L^{-1} phenol, and the quinone.	78ELL/EGA
99	Tetramethyl-1,4-benzosemiquinone (Durosemiquinone) $(CH_3)_4$-1,4-$C_6(OH)O\cdot$	3×10^8	2.7–5.7	EtOH/water (1/1)	292			f.p.	D.k. at 410 nm in deoxygenated soln., k corrected for new value of ε.	58BRI/POR
		7.3×10^8		2-PrOH	293	11.0	13.8	photo.	D.k. of ESR signal in deoxygenated soln.	72WON/SYT
		2.9×10^9		dioxane	293	12.3	15.9	photo.	D.k. of ESR signal in deoxygenated soln.	72WON/SYT
		4.4×10^8	acid	MeOH	RT			p.r.	D.k. at 420 nm in deoxygenated soln. contg. 0.01 mol L^{-1} H_2SO_4.	70LAN/SWA
		7.4×10^8		n-PrOH	RT			f.p.	D.k. at 410 nm in deoxygenated soln., $2k$ decreases with pressure to 4.6×10^8 at 245 MPa.	76CLA/BAC
		7.2×10^8	3.0	water/2-PrOH	RT			p.r.	D.k. at 420 nm in deoxygenated soln. contg. (1–3) mol L^{-1} 2-PrOH.	73RAO/HAY
		2.8×10^8		2-PrOH/toluene	293	10.25	11	photo.	D.k. (rotating sector) of ESR signal in deoxygenated soln. contg. 15% toluene and the quinone.	78ELL/EGA

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	log $2A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
		7.8×10^8		2-PrOH/toluene	293	11.3	14	photo.	D.k. (rotating sector) of ESR signal in deoxygenated soln. contg. 15% toluene, 0.1 mol L^{-1} phenol, and the quinone.	78ELL/EGA
		2.1×10^9		toluene/2-PrOH	293	11.6	13	photo.	D.k. (rotating sector) of ESR signal in deoxygenated soln. contg. 10% 2-PrOH and the quinone.	78ELL/EGA
		4.0×10^7		cyclohexanol	303	12.5	28	photo.	D.k. (rotating sector) of ESR signal in deoxygenated soln. contg. the quinone.	78ELL/EGA
100	Tetramethyl-1,4-benzosemiquinone anion (Durosemiquinone anion)									
	$(CH_3)_4$-1,4-$C_6(O^-)O\cdot$	3.4×10^6	7.8–9.1	EtOH/water (1/1)	292			f.p.	D.k. at 435 nm in deoxygenated soln., $k_{cor.}$ for new value of ε.	58BRI/POR
		2.9×10^7	9.0	water/2-PrOH	RT			p.r.	D.k. at 440 nm in deoxygenated soln. contg. (1–3) mol L^{-1} 2-PrOH. Decay includes reaction with the protonated radical. $pK_a=5.1$ for semiquinone radical.	73RAO/HAY
		2.3×10^8	7.2	water	RT			p.r.	D.k. at 440 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH and 0.01 mol L^{-1} acetone. $2k=1.5\times10^8$ in 0.6 mol L^{-1} 2-PrOH.	82SUT/SAN
101	Ubisemiquinone (30)									
	$Ubi(OH)O\cdot$	4.8×10^7	acid	MeOH	RT			p.r.	D.k. at 420 nm in deoxygenated soln. contg. 0.01 mol L^{-1} H_2SO_4.	70LAN/SWA
102	2,5-Bis(carboethoxyamino)-3,6-diaziridinyl-1,4-benzosemiquinone anion									
	$AZQ\cdot^- + AZQ\cdot^- + 2H^+ \rightarrow AZQ + AZQH_2$	8.9×10^5	7.0	water	RT			p.r.	D.k. at ~500 nm in soln. contg. formate. Mixed decay of $AZQ\cdot^-$ with $AZQH\cdot$.	87BUT/HOE
103	2,5-Bis(2-hydroxyethylamino)-3,6-diaziridinyl-1,4-benzosemiquinone radical anion									
	$BZQ\cdot^- + BZQ\cdot^- + 2H^+ \rightarrow BZQ + BZQH_2$	4.6×10^5	7.0	water	RT			p.r.	D.k. at ~500 nm in soln. contg. formate. Mixed decay of $BZQ\cdot^-$ with $BZQH\cdot$.	87BUT/HOE
104	Tetrafluoro-1,4-benzosemiquinone anion									
	1,4-$C_6F_4(O^-)O\cdot$	5.6×10^8	1.7	water	RT			p.r.	D.k. at 435 nm in N_2O-satd. soln. contg. 1 mol L^{-1} 2-PrOH. $pK_a=-1$ for radical.	94SHO/MIT
105	Tetrachloro-1,4-benzosemiquinone									
	1,4-$C_6Cl_4(OH)O\cdot$	1.7×10^8		2-PrOH	293			photo.	D.k. of ESR signal in deoxygenated soln.	72WON/SYT
		7.6×10^8		dioxane	293			photo.	D.k. of ESR signal in deoxygenated soln.	72WON/SYT
106	Tetrachloro-1,4-benzosemiquinone anion									

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ (L mol^{-1} s^{-1})	pH	Solvent	T (K)	log $2A$	E_a (kJ mol^{-1})	Method	Comments	Reference
	1,4-$C_6Cl_4(O^-)O\cdot$	4×10^6		EtOH	295			f.p.	D.k. of ESR signal in deoxygenated soln.	70HAL/BOL
		1.2×10^7		MeOH	295			f.p.	D.k. of ESR signal in deoxygenated soln.	70HAL/BOL
107	1,2-Naphthosemiquinone									
	1,2-Np(OH)O·	3.0×10^7	2.0	water	RT			f.p.	D.k. at 400 nm in deoxygenated soln.	78KHU/KUZ
108	2,3-Naphthosemiquinone anion									
	2,3-Naph(O^-)(O·)	6.1×10^8	11.5	water	RT			p.r.	D.k. at 366 nm in N_2O-satd. soln. contg. azide.	87ERB/BOR
109	1,4-Naphthosemiquinone									
	1,4-Np(OH)(O·)	2.6×10^8		EtOH	293			f.p.	D.k. of ESR signal in deoxygenated soln.	73AYS/SEA
		2.2×10^8		2-PrOH	293			f.p.	D.k. of ESR signal in deoxygenated soln.	73AYS/SEA
		2.3×10^8		2-PrOH	293			photo.	D.k. of ESR signal in deoxygenated soln.	72WON/SYT
		1.2×10^8		2-BuOH	293			f.p.	D.k. of ESR signal in deoxygenated soln.	73AYS/SEA
		1.4×10^8		2-Me-1-PrOH	293			f.p.	D.k. of ESR signal in deoxygenated soln.	73AYS/SEA
		1.2×10^8		Benzyl alcohol	293			f.p.	D.k. of ESR signal in deoxygenated soln.	73AYS/SEA
		9.0×10^8		dioxane	293			photo.	D.k. of ESR signal in deoxygenated soln.	72WON/SYT
		1.3×10^9	3.0	water/2-PrOH	RT			p.r.	D.k. at 370 nm in deoxygenated soln. contg. (1–3) mol L^{-1} 2-PrOH.	73RAO/HAY
110	1,4-Naphthosemiquinone anion									
	1,4-Np(O^-)O·	1.0×10^8	9.2	water/2-PrOH	RT			p.r.	D.k. at 390 nm in deoxygenated soln. contg. (1–3) mol L^{-1} 2-PrOH. Decay includes reaction with the protonated radical. pK_a =4.1 for semiquinone radical.	73RAO/HAY
111	2-Methyl-1,4-naphthosemiquinone									
	2-(CH_3)-1,4-Np(OH)O·	1.3×10^9	3.0	water/2-PrOH	RT			p.r.	D.k. at 370 nm in deoxygenated soln. contg. (1–3) mol L^{-1} 2-PrOH.	73RAO/HAY
		2.5×10^8		2-PrOH/toluene	293	10.9	14	photo.	D.k. (rotating sector) of ESR signal in deoxygenated soln. contg. 15% toluene and the quinone.	78ELL/EGA
112	2-Methyl-1,4-naphthosemiquinone anion									
	2-(CH_3)-1,4-Np(O^-)O·	1.6×10^8	9.2	water/2-PrOH	RT			p.r.	D.k. at 395 nm in deoxygenated soln. contg. (1–3) mol L^{-1} 2-PrOH. Decay includes reaction with the protonated radical. pK_a =4.5 for semiquinone radical.	73RAO/HAY

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	log $2A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
		4×10^7	7.2	water	RT			p.r.	D.k. at 390 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH and 0.01 mol L^{-1} acetone. $2k=1.6\times10^8$ in 0.6 mol L^{-1} 2-PrOH.	82SUT/SAN
113	2-Hydroxy-1,4-naphthosemiquinone									
	2-(OH)-1,4-Np(OH)O·	2.1×10^7	1.8	water/2-PrOH	RT			p.r.	D.k. at 360–370 nm in soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone. pK_a of radical 5.5 and 10.1.	96RAT/PAL
		2.1×10^7	6.7							
		1.5×10^7	10.3							
		1.5×10^7	13							
		3.6×10^7		2-PrOH	RT			p.r.	D.k. at 360–370 nm.	96RAT/PAL
114	5-Hydroxy-1,4-naphthosemiquinone									
	5-(OH)-1,4-Np(OH)O·	1.0×10^9	1.2	water	RT			p.r.	D.k. at 370 nm in soln. contg. formate. pK_a of radical 3.7.	87MUK
115	5-Hydroxy-1,4-naphthosemiquinone anion									
	5-(OH)-1,4-Np(O^-)O·	6.0×10^8	6.4	water	RT			p.r.	D.k. at 385 nm in soln. contg. formate.	87MUK
		6.9×10^8	10.5							
116	5,8-Dihydroxy-1,4-naphthosemiquinone									
	1,4,5,8-Np$(OH)_3$O·	2.0×10^9	1.2	water	RT			p.r.	D.k. in soln. contg. formate.	83LAN/MUKb
117	5,8-Dihydroxy-1,4-naphthosemiquinone anion									
	1,4,5,8-Np$(OH)_2(O^-)$O·	1.0×10^9	4.7	water	RT			p.r.	D.k. in soln. contg. formate. For reverse reaction $k_r=7\times10^7$ at pH 9.5.	83LAN/MUKb
		8×10^8	9.5							
		9.2×10^8	11							
		7×10^7	>14	water	RT			p.r.	D.k. in soln. contg. formate.	83LAN/MUKb
118	1,4-Naphthoquinone-2-oxyl									
	1,4-NQ-2-O·	7×10^7	7.0	water	RT			p.r.	D.k. at 340 or 450 nm in N_2O-satd. soln. contg. azide.	96RAT/PAL
119	1,4-Naphthoquinone-5-oxyl									
	1,4-NQ-5-O·	4.3×10^8	10.4	water	RT			p.r.	D.k. at 420 or 540 nm in N_2O-satd. soln. contg. azide.	96RAT/PAL
120	Kalafungin semiquinone (Kalafungin=pyranonaphthoquinone antibiotic)									
	Kalafungin-H·	1.5×10^9	2	water	RT			p.r.	D.k. at 385 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate. $pK_a=1.9$ for radical.	99AND/BRI
		1.1×10^9	7							
121	5-Hydroxy-7-O-methylkalafungin semiquinone									
	KF2-H·	8.3×10^8	2	water	RT			p.r.	D.k. at 395 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate. $pK_a=4.6$ for radical.	99AND/BRI
		1.2×10^8	7							
122	5-Hydroxy-7-deoxykalafungin semiquinone									
	KF3-H·	8.2×10^8	2	water	RT			p.r.	D.k. at 395 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate. $pK_a=2.0$ for radical.	99AND/BRI
		1.5×10^8	7							
123	5-*epi*-7-O-Methylkalafungin semiquinone									
	KF4-H·	2.7×10^9	2	water	RT			p.r.	D.k. at 385 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate. $pK_a=4.9$ for radical.	99AND/BRI
		6.5×10^8	7							

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	log $2A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
124	5-*epi*-7-Deoxykalafungin semiquinone KF5-HPY	1×10^9 4.8×10^8	2 7	water	RT			p.r.	D.k. at 385 nm in N_2O-satd. soln. contg. 0.1 $mol\ L^{-1}$ formate. $pK_a=2.3$ for radical.	99AND/BRI
125	9,10-Anthrasemiquinone 9,10-An(OH)O·	1.2×10^9		dioxane	293			photo.	D.k. of ESR signal in deoxygenated soln.	72WON/SYT
		7.5×10^8	2.0	water/2-PrOH	RT			p.r.	D.k. at 380 nm in soln. contg. 5 $mol\ L^{-1}$ 2-PrOH and 1 $mol\ L^{-1}$ acetone. pK_a of radical 4.4. Decay of semiquinone anion very slow.	94PAL/MUKa
		1.5×10^8	acid	MeOH	RT			p.r.	D.k. at 375 nm.	90MAY/KRA
126	9,10-Anthrasemiquinone anion 9,10-An(O^-)(O·)	4.9×10^7		2-PrOH	293			photo.	D.k. of ESR signal in deoxygenated soln.	72WON/SYT
127	1-Piperidino-9,10-anthrasemiquinone 1-Piperidino-9,10-An(OH)O·	7.0×10^8	1.7	water	RT			p.r.	D.k. at 400 nm in soln. contg. formate.	72HUL/LAN
128	2-Piperidino-9,10-anthrasemiquinone 2-Piperidino-9,10-An(OH)O·	6.2×10^8	1.7	water	RT			p.r.	D.k. at 400 nm in soln. contg. formate.	72HUL/LAN
129	9,10-Anthrasemiquinone-1-sulfonate 1-(SO_3^-)-9,10-An(OH)O·	3.0×10^9	1.7	water	RT			p.r.	D.k. at 400 nm in soln. contg. formate. $pK_a=5.4$ for semiquinone; anion decays more slowly to a mixture with the quinone and the hydroquinone.	72HUL/LAN
130	9,10-Anthrasemiquinone-2-sulfonate 2-(SO_3^-)-9,10-An(OH)O·	3.2×10^9	1.7	water	RT			p.r.	D.k. at 400 nm in soln. contg. formate. $pK_a=3.25$ for semiquinone; anion decays more slowly to a mixture with the quinone and the hydroquinone.	72HUL/LAN
		1.3×10^9	4	water	RT			p.r.	D.k. at 390 or 505 nm in deoxygenated soln. contg. formate.	77CLA/STO
131	9,10-Anthrasemiquinone-2-sulfonate anion 2-(SO_3^-)-9,10-An(O^-)O·	1.8×10^8	7.2	water	RT			p.r.	D.k. at 505 nm in deoxygenated soln. contg. 0.2 $mol\ L^{-1}$ 2-PrOH and 0.01 $mol\ L^{-1}$ acetone.	82SUT/SAN
132	9,10-Anthrasemiquinone-1,5-disulfonate 1,5-(SO_3^-)$_2$-9,10-An(OH)O·	2.7×10^8	2.0	water	RT			p.r.	D.k. at 385 nm in deoxygenated soln. contg. formate. pK_a of radical 6.1.	91PAL/PALb
133	9,10-Anthrasemiquinone-1,5-disulfonate anion									

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	log $2A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
	1,5-$(SO_3^-)_2$-9,10-An(O^-)O·	$<10^7$	8.4	water	RT			p.r.	D.k. at 500 nm in deoxygenated soln. contg. formate. pK_a of radical 6.1. Decay is via radical+radical anion.	91PAL/PALb
134	9,10-Anthrasemiquinone-2,6-disulfonate									
	2,6-$(SO_3^-)_2$-9,10-An(OH)O·	8.0×10^8 4.2×10^7	1.4 7.0	water	RT			p.r.	D.k. at 390 nm in deoxygenated soln. contg. formate. pK_a of radical 3.0. Decay at pH 7 is via radical +radical anion.	91PAL/PALb
135	9,10-Anthrasemiquinone-2,6-disulfonate anion									
	2,6-$(SO_3^-)_2$-9,10-An(O^-)O·	8.0×10^7	7.0	water	RT			f.p.	D.k. at 520 nm in deoxygenated soln. contg. 2% 2-PrOH. Decay includes reaction with the neutral semiquinone radical.	78KHU/KUZ
136	1-Amino-9,10-anthrasemiquinone									
	1-(NH_2)-9,10-An(OH)O·	2.7×10^8	2.0	water/2-PrOH	RT			p.r.	D.k. in soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone. pK_a of radical 5.8. Decay of semiquinone anion very slow.	94PAL/MUKa
137	1-Hydroxy-9,10-anthrasemiquinone									
	1-(OH)-9,10-An(OH)O·	1.0×10^9	2.0	water/2-PrOH	RT			p.r.	D.k. at 390 nm in soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone. pK_a of radical 4.6. Decay of semiquinone anion very slow.	94PAL/MUKa
138	2-Hydroxy-9,10-anthrasemiquinone									
	2-(OH)-9,10-An(OH)O·	5×10^8	1.5	water/2-PrOH	RT			p.r.	D.k. at 375 nm in soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone.	94PAL/MUKb
139	1,4-Diamino-9,10-anthrasemiquinone anion									
	1,4-$(NH_2)_2$-9,10-An(O^-)O·	2.5×10^9 1.6×10^9 1.1×10^9	14 3.5 1	water/2-PrOH	RT			p.r.	D.k. in soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone.	92PAL/PALa
140	1,5-Diamino-9,10-anthrasemiquinone									
	1,5-$(NH_2)_2$-9,10-An(OH)O·	7.0×10^8		2-PrOH	RT			p.r.	D.k. in deoxygenated soln.	91PAL/PALa
141	1-Amino-4-hydroxy-9,10-anthrasemiquinone anion									
	1-(NH_2)-4-(OH)-9,10-An(O^-)O·	6.7×10^9 1.5×10^9	14 1.5	water/2-PrOH	RT			p.r.	D.k. in soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone.	92PAL/PALa
142	1,4-Dihydroxy-9,10-anthrasemiquinone									
	1,4-$(OH)_2$-9,10-An(OH)O·	5.1×10^8	1.2	water/2-PrOH	RT			p.r.	D.k. in deoxygenated aqueous soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone.	90MUK/SWA
143	1,4-Dihydroxy-9,10-anthrasemiquinone anion									
	1,4-$(OH)_2$-9,10-An(O^-)O·	3.8×10^8	5.5	water/2-PrOH	RT			p.r.	D.k. in deoxygenated aqueous soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone. Mixed decay of neutral and anion. Decay of anion at higher pH much slower.	90MUK/SWA

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	log $2A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
144	1,5-Dihydroxy-9,10-anthrasemiquinone									
	1,5-$(OH)_2$-9,10-An(OH)O·	1.6×10^8		2-PrOH	RT			p.r.	D.k. in deoxygenated soln.	91PAL/PALa
		7.7×10^8	1.3	water/2-PrOH	RT			p.r.	D.k. in aqueous soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone.	91PAL/PALc
145	1,5-Dihydroxy-9,10-anthrasemiquinone anion									
	1,5-$(OH)_2$-9,10-An(O^-)O·	1.5×10^9	14	water/2-PrOH	RT			p.r.	D.k. in aqueous soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone.	91PAL/PALc
146	2,6-Dihydroxy-9,10-anthrasemiquinone									
	2,6-$(OH)_2$-9,10-An(OH)O·	4×10^8	1.5	water/2-PrOH	RT			p.r.	D.k. at 400 nm in soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone.	94PAL/MUKb
147	1,8-Dihydroxy-9,10-anthrasemiquinone									
	1,8-$(OH)_2$-9,10-An(OH)O·	1.7×10^8		2-PrOH	RT			p.r.	D.k. in deoxygenated soln.	91PAL/PALa
		4.6×10^8	1.3	water/2-PrOH	RT			p.r.	D.k. in aqueous soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone.	91PAL/PALc
148	1,8-Dihydroxy-9,10-anthrasemiquinone anion									
	1,8-$(OH)_2$-9,10-An(O^-)O·	1.6×10^9	14	water/2-PrOH	RT			p.r.	D.k. in aqueous soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone.	91PAL/PALc
149	1,4-Dihydroxy-9,10-anthrasemiquinone-2-sulfonate									
	2-(SO_3^-)-1,4-$(OH)_2$-9,10-An(OH)O·	1.3×10^9	1.1	water	RT			p.r.	D.k. at 475 and 720 nm in deoxygenated soln. contg. formate.	88MUK/LAN
150	1,4-Dihydroxy-9,10-anthrasemiquinone-2-sulfonate anion									
	2-(SO_3^-)-1,4-$(OH)_2$-9,10-An(O^-)O·	9.9×10^8	5.7	water	RT			p.r.	D.k. at 475 and 720 nm in deoxygenated soln. contg. formate. Mixed decay of neutral and anionic radicals.	88MUK/LAN
151	9,10-Anthraquinone-1,4-semiquinone anion									
	1,4-(OH)(O·)-9,10-AQ	6.0×10^8	14	water	RT			p.r.	D.k. in N_2O-satd. soln. contg. azide.	92PAL/PALb
		$<10^7$	11							
152	9,10-Anthraquinone-1,5-semiquinone anion									
	1,5-(O^-)(O·)-9,10-AQ	6.0×10^8	11	water	RT			p.r.	D.k. in N_2O-satd. soln. contg. azide.	91PAL/PALc
		1.3×10^{10}	14							
153	9,10-Anthraquinone-1,8-semiquinone anion									
	1,8-(O^-)(O·)-9,10-AQ	4.1×10^9	11	water	RT			p.r.	D.k. in N_2O-satd. soln. contg. azide.	91PAL/PALc
		1.4×10^9	14							
154	9,10-Anthraquinone-2-sulfonate-1,4-semiquinone									
	1,4-(OH)(O·)-9,10-AQ-2-SO_3^-	5.7×10^9	1	water	RT			p.r.	D.k. in N_2O-satd. soln. contg. ethylene glycol.	92PAL/PALb
155	9,10-Anthraquinone-2-sulfonate-1,4-semiquinone anion									
	1,4-(O^-)(O·)-9,10-AQ-2-SO_3^-	5.5×10^8	14	water	RT			p.r.	D.k. in N_2O-satd. soln. contg. azide or bromide.	92PAL/PALb
156	9,10-Anthraquinone-6-sulfonate-1,4-semiquinone									

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	log $2A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
	1,4-(OH)(O·)-9,10-AQ-6-SO_3^-	4.4×10^9	1	water	RT			p.r.	D.k. in N_2O-satd. soln. contg. ethylene glycol.	92PAL/PALb
157	9,10-Anthraquinone-6-sulfonate-1,4-semiquinone anion									
	1,4-(O^-)(O·)-9,10-AQ-6-SO_3^-	4.3×10^8	14	water	RT			p.r.	D.k. in N_2O-satd. soln. contg. azide or bromide.	92PAL/PALb
158	Adriamycin semiquinone anion									
	Adria(O^-)O·	5.6×10^8	13	water	RT			p.r.	D.k. at 720 nm in soln. contg. formate.	85LAN/MUK
159	Adriamycin semiquinone									
	Adria(OH)O·	1.3×10^9	1.1	water	RT			p.r.	D.k. at 720 nm in soln. contg. formate.	85LAN/MUK
160	Indole-5,6-semiquinone anion									
	Indole-5,6-(O^-)(O·)	1.8×10^8	8.8	water	RT			p.r.	D.k. at 325 nm in N_2O-satd. soln. contg. azide.	91ALK/ONE
161	Indole-5,6-semiquinone									
	Indole-5,6-(OH)(O·)	3.8×10^9	5.5	water	RT			p.r.	D.k. at 325 nm in N_2O-satd. soln. contg. azide. pK_a of radical 6.8.	91ALK/ONE
162	N-Methylindole-5,6-semiquinone anion									
	N-Me-Indole-5,6-(O^-)(O·)	1.0×10^8	8.8	water	RT			p.r.	D.k. at 325 nm in N_2O-satd. soln. contg. azide.	91ALK/ONE
163	2-Hydroxyestradiol semiquinone (radical+anion)									
	2,3-Estr(O^-)(O·)	3.1×10^7	7.0	water	RT			p.r.	D.k. at 320 nm in N_2O-satd. soln. contg. azide. Decay mostly via 2,3-Estr(O^-)(O·) +2,3-Estr(OH)(O·)	93LAN
164	Catechin semiquinone anion									
	Catechin-O·	5.9×10^5	11.5	water	RT			p.r.	D.k. at 315 nm in N_2O-satd. soln. contg. azide.	87ERB/BOR
165	Epicatechin semiquinone anion									
	Epicatechin-O·	5.3×10^5	11.5	water	RT			p.r.	D.k. at 315 nm in N_2O-satd. soln. contg. azide.	87ERB/BOR
166	Fisetin semiquinone anion									
	Fisetin-O·	1.2×10^7	8.5	water	RT			p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} azide.	95BOR/MIC
167	Kaempferol semiquinone anion									
	Kaempferol-O·	1.1×10^8	8.5	water	RT			p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} azide.	95BOR/MIC
		1.4×10^8	11.5	water	RT			p.r.	D.k. at 545 nm in N_2O-satd. soln. contg. azide or thiocyanate.	87ERB/BOR
168	Luteolin semiquinone anion									
	Luteolin-O·	5.8×10^7	8.5	water	RT			p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} azide.	95BOR/MIC
169	Quercetin semiquinone anion									

TABLE 1. Self-reactions of phenoxyl radicals (R+R→products, $-d[R]/dt=2k[R]^2$, values of $2k$ are tabulated) —Continued

No.	Phenoxyl structure or reaction	$2k$ (L mol^{-1} s^{-1})	pH	Solvent	T (K)	log $2A$	E_a (kJ mol^{-1})	Method	Comments	Reference
	Quercetin-O·	6.0×10^7	8.5	water	RT			p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} azide.	95BOR/MIC
		3.3×10^6	11.5	water	RT			p.r.	D.k. at 525 nm in N_2O-satd. soln. contg. azide or thiocyanate.	87ERB/BOR
170	Dihydroquercetin semiquinone anion									
	Dihydroquercetin-O·	1.3×10^6	8.5	water	RT			p.r.	Decay and formn. kinetics at 367 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} azide.	95BOR/MIC
171	Rutin semiquinone anion									
	Rutin-O·	1.0×10^7	8.5	water	RT			p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} azide.	95BOR/MIC

TABLE 2. Reactions of phenoxyl radicals with other radicals ($R_1 + R_2 \rightarrow$ products, $-d[R_1]/dt = -d[R_2]/dt = k[R_1][R_2]$, values of k are tabulated)

No.	Phenoxyl + other radical Reaction	k ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	Method	Comments	Reference
1	Galvinoxyl + Iodine atom							
	Galv-O· + I·	4.0×10^{9}		CCl_4	298	f.p.	D.k. at 432 nm in soln. contg. I_2 and galvinoxyl radical. $E_a = 8\ kJ\ mol^{-1}$.	83KHU/TAT
		1.2×10^{10}		n-hexane	298	f.p.	D.k. at 432 nm in soln. contg. I_2 and galvinoxyl radical.	83KHU/TAT
2	Phenoxyl + Superoxide							
	$C_6H_5O· + O_2·^-$	2.0×10^{9}	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 87% electron transfer.	93JON/LIN
3	4-Methylphenoxyl + Superoxide							
	4-$CH_3C_6H_4O· + O_2·^-$	1.7×10^{9}	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 83% electron transfer.	93JON/LIN
4	4-tert-Butylphenoxyl + Superoxide							
	4-(t-Bu)$C_6H_4O· + O_2·^-$	7.0×10^{8}	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L−1 HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 74% electron transfer.	93JON/LIN
5	4-(2-Aminoethyl)phenoxyl (Tyramine phenoxyl) + Superoxide							
	4-($H_2NCH_2CH_2$)$C_6H_4O· + O_2·^-$	1.0×10^{9}	11	water	RT	p.r.	D.k. at 400–410 nm in N_2O/O_2-satd. soln. contg. azide and formate. Reaction mainly via addn.	00DAL/BIA
6	Tyrosyl + Superoxide							
	$TyrO· + O_2·^-$	1.7×10^{9}	9.5	water	RT	p.r.	D.k. at 407 nm in N_2O/O_2-satd. soln. contg. azide and formate.	87CUD/JOS
		1.5×10^{9}	9	water	RT	p.r.	D.k. at 405 nm in N_2O-satd. soln. contg. azide and formate. Product analysis suggests reaction via addn.	93JIN/LEI
7	4-(2-Hydroxyethyl)phenoxyl (Tyrosol phenoxyl) + Superoxide							
	4-($HOCH_2CH_2$)$C_6H_4O· + O_2·^-$	2.3×10^{9}	11	water	RT	p.r.	D.k. at 400–410 nm in N_2O/O_2-satd. soln. contg. azide and formate. Reaction mainly via addn.	00DAL/BIA
8	4-Cyanophenoxyl + Superoxide							
	4-$NCC_6H_4O· + O_2·^-$	2.1×10^{8}	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 92% electron transfer.	93JON/LIN
		4.5×10^{8}	11	water	RT	p.r.	D.k. at 436 nm in N_2O/O_2-satd. soln. contg. azide and formate. Reaction proceeds mainly via addition.	00DAL/BIA
9	4-Aminophenoxyl + Superoxide							
	4-$H_2NC_6H_4O· + O_2·^-$	9.7×10^{8}	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 60% electron transfer at pH 7.	93JON/LIN
10	4-Methoxyphenoxyl + Superoxide							
	4-$CH_3OC_6H_4O· + O_2·^-$	8.4×10^{8}	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 56% electron transfer.	93JON/LIN

TABLE 2. Reactions of phenoxyl radicals with other radicals ($R_1 + R_2 \rightarrow$ products, $-d[R_1]/dt = -d[R_2]/dt = k[R_1][R_2]$, values of k are tabulated)—Continued

No.	Phenoxyl + other radical Reaction	k (L mol^{-1} s^{-1})	pH	Solvent	T (K)	Method	Comments	Reference
11	4-Fluorophenoxyl + Superoxide 4-$FC_6H_4O\cdot + O_2\cdot^-$	2.9×10^9	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 91% electron transfer.	93JON/LIN
12	2-Methoxy-4-methylphenoxyl + Superoxide 2-(CH_3O)-4-$(CH_3)C_6H_3O\cdot + O_2\cdot^-$	1.1×10^9	11	water	RT	p.r.	D.k. at 400–420 nm in N_2O/O_2-satd. soln. contg. azide and formate. Reaction proceeds mainly via addn.	00DAL/BIA
		1.4×10^9	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 30% electron transfer.	93JON/LIN
13	2,4,6-Trimethylphenoxyl + Superoxide 2,4,6-$(CH_3)_3C_6H_2O\cdot + O_2\cdot^-$	1.2×10^9	11	water	RT	p.r.	D.k. at 400–420 nm in N_2O/O_2-satd. soln. contg. azide and formate. Reaction proceeds mainly via addn.	00DAL/BIA
		1.2×10^9	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 40% electron transfer.	93JON/LIN
14	4-Carboxy-2,6-dimethoxyphenoxyl + Superoxide 4-(CO_2^-)-2,6-$(CH_3O)_2C_6H_2O\cdot + O_2\cdot^-$	1.2×10^9	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 60% electron transfer.	93JON/LIN
15	4-tert-Butyl-2,6-dimethoxyphenoxyl + Superoxide 4-(t-Bu)-2,6-$(CH_3O)_2C_6H_2O\cdot + O_2\cdot^-$	3.0×10^9	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 50% electron transfer.	93JON/LIN
16	3,5-Diiodotyrosyl + Superoxide 3,5-I_2-TyrO3,5-I_2-TyrO$\cdot + O_2\cdot^-$	6.5×10^9 5×10^9	7.4 12	water	RT	p.r.	D.k. at 350 nm in N_2O-satd. soln. contg. N_3^- and H_2O_2. k similar in the absence of azide. k reported for reaction of diiodotyrosyl with O_2 are probably in error and are due to reaction with superoxide.	96DAS
17	2,4,6-Trichlorophenoxyl + Superoxide 2,4,6-$Cl_3C_6H_2O\cdot + O_2\cdot^-$	1.6×10^9	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 94% electron transfer.	93JON/LIN
18	2,4,6-Tribromophenoxyl + Superoxide 2,4,6-$Br_3C_6H_2O\cdot + O_2\cdot^-$	1.2×10^9	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 88% electron transfer.	93JON/LIN
19	2,4,6-Triiodophenoxyl + Superoxide 2,4,6-$I_3C_6H_2O\cdot + O_2\cdot^-$	1.1×10^9	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 75% electron transfer.	93JON/LIN

TABLE 2. Reactions of phenoxyl radicals with other radicals ($R_1 + R_2 \rightarrow$ products, $-d[R_1]/dt = -d[R_2]/dt = k[R_1][R_2]$, values of k are tabulated)—Continued

No.	Phenoxyl + other radical Reaction	k ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	Method	Comments	Reference
20	Pyrogallol radical + Superoxide 1,2,3-$C_6H_3(OH)(O^-)O\cdot + O_2\cdot^-$	1.5×10^8	6.7	water	RT	p.r.	D.k. at 300 nm in N_2O-satd. soln. contg. bromide. Reaction probably forms hydroxy-o-quinone.	88DEE/PAR
21	n-Propyl gallate radical + Superoxide 3,4,5-$(OH)(O\cdot)C_6H_2CO_2C_3H_7 + O_2\cdot^-$	1.6×10^8	6.7	water	RT	p.r.	D.k. in N_2O-satd. soln. contg. bromide. Reaction probably forms the hydroxy-o-quinone of propyl gallate.	88DEE/PAR
22	Trolox phenoxyl radical + Superoxide $TxO\cdot + O_2\cdot^-$	4.5×10^8	7	water	RT	p.r.	D.k. at 440 nm in soln. contg. 0.5 mol L^{-1} HCO_2^-, 0.05 mol L^{-1} Br^-, 1 mmol L^{-1} Trolox, satd. with O_2 or N_2O.	89CAD/MER
		5.5×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in O_2-satd. soln. contg. 0.2 mol L^{-1} HCO_2^-, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol. 11% electron transfer.	93JON/LIN
23	α-Tocopheroxyl + Superoxide α-Toc-$O\cdot + O_2\cdot^-$	$\approx10^9$		MeOH	RT	f.p.	D.k. at 430 nm. Electron transfer.	91BIS/PAR
24	2,4,6-Tri(tert-butyl)phenoxyl + tert-Butyl 2,4,6-$(t\text{-}Bu)_3C_6H_2O\cdot + (CH_3)_3C\cdot$	2×10^9		n-heptane			Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide and di-t-butylketone.	89RUE/FIS
25	2,6-Di(tert-butyl)-4-methylphenoxyl + 1-Hydroxyethyl2,6-$(t\text{-}Bu)_2$-4-$(CH_3)C_6H_2O\cdot + CH_3CH\cdot(OH)$	$\approx3\times10^9$		1,2-epoxybutane /EtOH		photo.	Kinetic ESR (rotating sector) in 1,2-epoxybutane soln. contg. 6.5 mol L^{-1} EtOH and 2 mol L^{-1} di-t-butyl peroxide. k estd. from data in paper.	89RUE/FIS
26	2,6-Di(tert-butyl)phenoxyl + 2-Hydroxy-2-methylethyl 2,6-$(t\text{-}Bu)_2C_6H_3O\cdot + (CH_3)_2C\cdot OH$	9.0×10^8		2-PrOH	275	photo.	Kinetic ESR (rotating sector) in soln. contg. di-t-butyl peroxide. $E_a = 19.8$ kJ mol^{-1}, log A log $A = 12.7$.	88RUE/FIS
27	4-Methylphenoxyl + 2-Hydroxy-2,2-dimethylethyl 4-$CH_3C_6H_4O\cdot + HOC(CH_3)_2CH_2\cdot$	5.6×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in N_2O-satd. soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol.	93JON/LIN
28	4-tert-Butylphenoxyl + 2-Hydroxy-2,2-dimethylethyl 4-$(t\text{-}Bu)C_6H_4O\cdot + HOC(CH_3)_2CH_2\cdot$	6.0×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in N_2O-satd. soln. contg. 1 mol L^{-1} t-BuOH , 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol.	93JON/LIN
29	4-Cyanophenoxyl + 2-Hydroxy-2,2-dimethylethyl 4-$NCC_6H_4O\cdot + HOC(CH_3)_2CH_2\cdot$	1.0×10^9	9.2	water	RT	p.r.	D.k. at 400–550 nm in N_2O-satd. soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol.	93JON/LIN
30	4-Aminophenoxyl + 2-Hydroxy-2,2-dimethylethyl 4-$H_2NC_6H_4O\cdot + HOC(CH_3)_2CH_2\cdot$	3.9×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in N_2O-satd. soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol.	93JON/LIN

TABLE 2. Reactions of phenoxyl radicals with other radicals ($R_1 + R_2 \rightarrow$ products, $-d[R_1]/dt = -d[R_2]/dt = k[R_1][R_2]$, values of k are tabulated)—Continued

No.	Phenoxyl + other radical Reaction	k (L mol^{-1} s^{-1})	pH	Solvent	T (K)	Method	Comments	Reference
31	4-Methoxyphenoxyl + 2-Hydroxy-2,2-dimethylethyl 4-$CH_3OC_6H_4O\cdot$ + $HOC(CH_3)_2CH_2\cdot$	5.0×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in N_2O-satd. soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol.	93JON/LIN
32	2-Methoxy-4-methylphenoxyl + 2-Hydroxy-2,2-dimethylethyl 2-CH_3O-4-$CH_3C_6H_3O\cdot$ + $HOC(CH_3)_2CH_2\cdot$	3.3×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in N_2O-satd. soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol.	93JON/LIN
33	2,4,6-Trimethylphenoxyl + 2-Hydroxy-2,2-dimethylethyl 2,4,6-$(CH_3)_3C_6H_2O\cdot$ + $HOC(CH_3)_2CH_2\cdot$	4.3×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in N_2O-satd. soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol.	93JON/LIN
34	4-Carboxy-2,6-dimethoxyphenoxyl + 2-Hydroxy-2,2-dimethylethyl 4-(CO_2^-)-2,6-$(CH_3O)_2C_6H_2O\cdot$ + $HOC(CH_3)_2CH_2\cdot$	2.5×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in N_2O-satd. soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol.	93JON/LIN
35	2,4,6-Trichlorophenoxyl + 2-Hydroxy-2,2-dimethylethyl 2,4,6-$Cl_3C_6H_2O\cdot$ + $HOC(CH_3)_2CH_2\cdot$	5.2×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in N_2O-satd. soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol.	93JON/LIN
36	2,4,6-Tribromophenoxyl + 2-Hydroxy-2,2-dimethylethyl 2,4,6-$Br_3C_6H_2O\cdot$ + $HOC(CH_3)_2CH_2\cdot$	5.6×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in N_2O-satd. soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol.	93JON/LIN
37	2,4,6-Triiodophenoxyl + 2-Hydroxy-2,2-dimethylethyl 2,4,6-$I_3C_6H_2O\cdot$ + $HOC(CH_3)_2CH_2\cdot$	1.5×10^9	9.2	water	RT	p.r.	D.k. at 400–550 nm in N_2O-satd. soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol.	93JON/LIN
38	Trolox phenoxyl radical + 2-Hydroxy-2,2-dimethylethyl TxO· + $HOC(CH_3)_2CH_2\cdot$	1.5×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in N_2O-satd. soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol.	93JON/LIN
39	4-(2-Hydroxyethyl)phenoxyl + Methylperoxyl 4-$(HOCH_2CH_2)C_6H_4O\cdot$ + $CH_3O_2\cdot$	1.1×10^9	11	water	RT	p.r.	D.k. at 400–410 nm in N_2O/O_2-satd. soln. contg. azide and dimethyl sulfoxide.	00DAL/BIA
40	4-Methylphenoxyl + 2-Hydroxy-2,2-dimethylethylperoxyl 4-$CH_3C_6H_4O\cdot$ + $HOC(CH_3)_2CH_2O_2\cdot$	8.2×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol, satd. with N_2O/O_2.	93JON/LIN
41	4-tert-Butylphenoxyl + 2-Hydroxy-2,2-dimethylethylperoxyl 4-(t-Bu)$C_6H_4O\cdot$ + $HOC(CH_3)_2CH_2O_2\cdot$	6.0×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol, satd. with N_2O/O_2.	93JON/LIN

TABLE 2. Reactions of phenoxyl radicals with other radicals ($R_1 + R_2 \rightarrow$ products, $-d[R_1]/dt = -d[R_2]/dt = k[R_1][R_2]$, values of k are tabulated)—Continued

No.	Phenoxyl + other radical Reaction	k ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	Method	Comments	Reference
42	4-(2-Hydroxyethyl)phenoxyl + 2-Hydroxy-2,2-dimethylethylperoxyl $4\text{-}(HOCH_2CH_2)C_6H_4O\cdot + HOC(CH_3)_2CH_2O_2\cdot$	8.9×10^8	11	water	RT	p.r.	D.k. at 400–410 nm in N_2O/O_2-satd. soln. contg. azide and t-BuOH.	00DAL/BIA
43	4-Cyanophenoxyl + 2-Hydroxy-2,2-dimethylethylperoxyl $4\text{-}NCC_6H_4O\cdot + HOC(CH_3)_2CH_2O_2\cdot$	2.0×10^9	9.2	water	RT	p.r.	D.k. at 400–550 nm in soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol, satd. with N_2O/O_2.	93JON/LIN
44	4-Aminophenoxyl + 2-Hydroxy-2,2-dimethylethylperoxyl $4\text{-}H_2NC_6H_4O\cdot + HOC(CH_3)_2CH_2O_2\cdot$	2.5×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol, satd. with N_2O/O_2.	93JON/LIN
45	4-Methoxyphenoxyl + 2-Hydroxy-2,2-dimethylethylperoxyl $4\text{-}CH_3OC_6H_4O\cdot + HOC(CH_3)_2CH_2O_2\cdot$	8.8×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol, satd. with N_2O/O_2.	93JON/LIN
46	2-Methoxy-4-methylphenoxyl + 2-Hydroxy-2,2-dimethylethylperoxyl $2\text{-}CH_3O\text{-}4\text{-}CH_3C_6H_3O\cdot + HOC(CH_3)_2CH_2O_2\cdot$	4.1×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol, satd. with N_2O/O_2.	93JON/LIN
47	2,4,6-Trimethylphenoxyl + 2-Hydroxy-2,2-dimethylethylperoxyl $2,4,6\text{-}(CH_3)_3C_6H_2O\cdot + HOC(CH_3)_2CH_2O_2\cdot$	4.8×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol, satd. with N_2O/O_2.	93JON/LIN
48	4-Carboxy-2,6-dimethoxyphenoxyl + 2-Hydroxy-2,2-dimethylethylperoxyl $4\text{-}(CO_2^-)\text{-}2,6\text{-}(CH_3O)_2C_6H_2O\cdot + HOC(CH_3)_2CH_2O_2\cdot$	1×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol, satd. with N_2O/O_2.	93JON/LIN
49	2,4,6-Trichlorophenoxyl + 2-Hydroxy-2,2-dimethylethylperoxyl $2,4,6\text{-}Cl_3C_6H_2O\cdot + HOC(CH_3)_2CH_2O_2\cdot$	8.8×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol, satd. with N_2O/O_2.	93JON/LIN
50	2,4,6-Tribromophenoxyl + 2-Hydroxy-2,2-dimethylethylperoxyl $2,4,6\text{-}Br_3C_6H_2O\cdot + HOC(CH_3)_2CH_2O_2\cdot$	9.3×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol, satd. with N_2O/O_2.	93JON/LIN
51	2,4,6-Triiodophenoxyl + 2-Hydroxy-2,2-dimethylethylperoxyl $2,4,6\text{-}I_3C_6H_2O\cdot + HOC(CH_3)_2CH_2O_2\cdot$	1.0×10^9	9.2	water	RT	p.r.	D.k. at 400–550 nm in soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} of the phenol, satd. with N_2O/O_2.	93JON/LIN
52	Trolox phenoxyl radical + 2-Hydroxy-2,2-dimethylethylperoxyl $TxO\cdot + HOC(CH_3)_2CH_2O_2\cdot$	1.6×10^8	9.2	water	RT	p.r.	D.k. at 400–550 nm in soln. contg. 1 mol L^{-1} t-BuOH, 0.01 mol L^{-1} N_3^-, and 1 mmol L^{-1} Trolox, satd. with N_2O/O_2.	93JON/LIN

TABLE 2. Reactions of phenoxyl radicals with other radicals ($R_1 + R_2 \rightarrow$ products, $-d[R_1]/dt = -d[R_2]/dt = k[R_1][R_2]$, values of k are tabulated)—Continued

No.	Phenoxyl + other radical Reaction	k (L mol^{-1} s^{-1})	pH	Solvent	T (K)	Method	Comments	Reference
53	2,4,6-Tri-t-butylphenoxyl + Cyclohexylperoxyl 2,4,6-(t-Bu)$_3$C$_6$H$_2$O· + c-C$_6$H$_{11}$OO·	9.9×10^8		cyclohexane	293	f.p.	D.k. at 400 nm in soln. contg. the phenol and oxygen in cyclohexane. Similar k for the mixture of peroxyl radicals formed in n-hexane and a 30% lower value in tridecane.	89NIK/SAF
54	α-Tocopheroxyl + 2-Cyano-2,4-dimethylbutylperoxyl α-Toc-O· + (CH$_3$)$_2$CHCH$_2$C(CH$_3$)(CN)OO·	$\approx4\times10^8$		PhCl	318	Therm.	Radicals generated by reaction of 2,2′-azobis(2,4-dimethylvaleronitrile). Monitored absorbance at 424 nm vs 440 nm.	95BOW/ING
55	2,4,6-Tri-t-butylphenoxyl + Cumylperoxyl 2,4,6-(t-Bu)$_3$C$_6$H$_2$O· + PhCMe$_2$OO·	2×10^8		benzene	303	chem.	Decay of ESR signal of the phenoxyl radical in deoxygenated soln.	73GRI/DEN
		1.1×10^8		cyclohexane	293	f.p.	D.k. at 625 nm in deoxygenated soln. contg. tetraphenylhydrazine and cumene hydroperoxide.	87VAR/SAF
56	2,2,5,7,8-Pentamethylchroman-6-oxyl + 2,6-di-tert-butyl-4-methylphenoxyl PMC-O· + 2,6-(t-Bu)$_2$-4-MeC$_6$H$_2$O·	1.8×10^5		benzene	323	therm.	Steady-state ESR signal in deoxygenated soln. contg. the phenol and di-tert-butyl hyponitrite.	87ROG/KRA
57	Kaempferol semiquinone anion + Ascorbate radical anion Kaempferol-O· + Asc·$^-$	3.4×10^8	8.5	water	RT	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} azide. Electron transfer.	95BOR/MIC
58	Luteolin semiquinone anion + Ascorbate radical anion Luteolin-O· + Asc·$^-$	2.0×10^6	8.5	water	RT	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} azide. Electron transfer.	95BOR/MIC
59	Fisetin semiquinone anion + Ascorbate radical anion Fisetin-O· + Asc·$^-$	7.1×10^7	8.5	water	RT	p.r.	Decay and formation kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} azide. Electron transfer.	95BOR/MIC
60	Quercetin semiquinone + Ascorbate radical anion Quercetin-O· + Asc·$^-$	1.5×10^7	8.5	water	RT	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} azide. Electron transfer.	95BOR/MIC
61	Rutin semiquinone anion + Ascorbate radical anion Rutin-O· + Asc·$^-$	3.5×10^7	8.5	water	RT	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} azide. Electron transfer.	95BOR/MIC
62	Dihydroquercetin semiquinone anion + Ascorbate radical anion Dihydroquercetin-O· + Asc·$^-$	4.7×10^7	8.5	water	RT	p.r.	Decay and formn. kinetics at 367 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} azide. Electron transfer.	95BOR/MIC

TABLE 2. Reactions of phenoxyl radicals with other radicals ($R_1 + R_2 \rightarrow$ products, $-d[R_1]/dt = -d[R_2]/dt = k[R_1][R_2]$, values of k are tabulated)—Continued

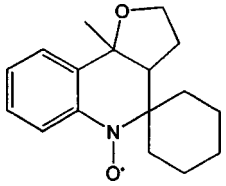
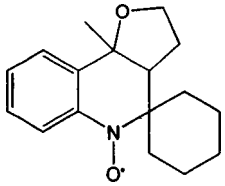
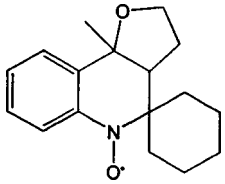
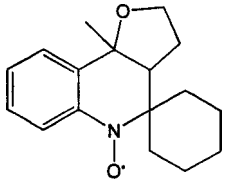
No.	Phenoxyl + other radical Reaction	k ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	Method	Comments	Reference
63	9,10-Anthrasemiquinone-2,6-disulfonate anion + 4-(2-Bromoethyl)-2,2,6,6-tetramethyl-1-piperidinyloxyl ($R_2NO\cdot$)							
	2,6-$(SO_3^-)_2$-9,10-An$(O^-)O\cdot + R_2NO\cdot \rightarrow$ 2,6-$(SO_3^-)_2$-9,10-An$(O)_2 + R_2NO^-$	1.9×10^5		water/ n-PrOH	RT	f.p.	D.k. at 500 nm in deoxygenated n-PrOH/water (2/1).	81TAT/KHU
64	9,10-Anthrasemiquinone-2-sulfonate anion + 4-Hydroxy-2,2,6,6-tetramethyl-1-piperidinyloxyl radical ($R_2NO\cdot$)							
	2-(SO_3^-)-9,10-An$(O^-)O\cdot + R_2NO\cdot \rightarrow$ 2-(SO_3^-)-9,10-An$(O)_2 + R_2NO^-$	4.0×10^3		water/ n-PrOH	RT	f.p.	D.k. at 500 nm in deoxygenated soln. contg. 20% n-PrOH. $E_a = 24.7$ kJ mol^{-1}, log $A = 7.5$.	81TAT/KHU
65	9,10-Anthrasemiquinone-2,6-disulfonate anion + 4-Hydroxy-2,2,6,6-tetramethyl-1-piperidinyloxyl radical($R_2NO\cdot$)							
	2,6-$(SO_3^-)_2$-9,10-An$(O^-)O\cdot + R_2NO\cdot \rightarrow$ 2,6-$(SO_3^-)_2$-9,10-An$(O)_2 + R_2NO^-$	9.5×10^2		water/ n-PrOH	RT	f.p.	D.k. at 500 nm in deoxygenated soln. contg. 20% n-PrOH. $E_a = 28.0$ kJ mol^{-1}, log $A = 7.7$.	81TAT/KHU
66	9,10-Anthrasemiquinone-2,6-disulfonate anion + 2,2,4,5,5-Pentamethyl-1-imidazolinyloxyl ($R_2NO\cdot$)							
	2,6-$(SO_3^-)_2$-9,10-An$(O^-)O\cdot + R_2NO\cdot \rightarrow$ 2,6-$(SO_3^-)_2$-9,10-An$(O)_2 + R_2NO^-$	4.4×10^4		water/ n-PrOH	RT	f.p.	D.k. at 500 nm in deoxygenated soln. contg. 20% n-PrOH.	81TAT/KHU
67	9,10-Anthrasemiquinone-2,6-disulfonate anion + 2,2,5-Trimethyl-5-phenyl-1-imidazolinyloxyl radical ($R_2NO\cdot$)							
	2,6-$(SO_3^-)_2$-9,10-An$(O^-)O\cdot + R_2NO\cdot \rightarrow$ 2,6-$(SO_3^-)_2$-9,10-An$(O)_2 + R_2NO^-$	1.5×10^4		water/n-PrOH	RT	f.p.	D.k. at 500 nm in deoxygenated soln. contg. 20% n-PrOH.	81TAT/KHU
68	9,10-Anthrasemiquinone-2-sulfonate anion + 2,2,5-Trimethyl-5-phenyl-3-oxo-1-imidazolinyloxyl radical ($R_2NO\cdot$)							
	2-(SO_3^-)-9,10-An$(O^-)O\cdot + R_2NO\cdot \rightarrow$ 2-(SO_3^-)-9,10-An$(O)_2 + R_2NO^-$	4.5×10^7		water/ n-PrOH	RT	f.p.	D.k. at 500 nm in deoxygenated soln. contg. 20% n-PrOH.	81TAT/KHU
69	Durosemiquinone anion + (RArNO$\cdot$) 							
	$C_6(CH_3)_4(O^-)O\cdot + RArNO\cdot \rightarrow C_6(CH_3)_4(O)_2 + RArNO^-$	1.2×10^7		water/ n-PrOH	RT	f.p.	D.k. at 440 nm in deoxygenated soln. contg. 20% n-PrOH.	81TAT/KHU
70	2-Methyl-1,4-naphthosemiquinone anion + (RArNO$\cdot$) 							
	2-(CH_3)-1,4-Np$(O^-)O\cdot$ + RArNO$\cdot \rightarrow$ 2-(CH_3)-1,4-Np$(O)_2$ + $RArNO^-$	2.0×10^6		water/ n-PrOH	RT	f.p.	D.k. at 390 nm in deoxygenated soln. contg. 20% n-PrOH.	81TAT/KHU
71	9,10-Anthrasemiquinone-2-sulfonate anion + (RArNO$\cdot$) 							
	2-(SO_3^-)-9,10-An$(O^-)O\cdot + RArNO\cdot \rightarrow$ 2-(SO_3^-)-9,10-An$(O)_2 + RArNO^-$	2.6×10^8		water/ n-PrOH	RT	f.p.	D.k. at 500 nm in deoxygenated soln. contg. 20% n-PrOH. $E_a = 9.6$ kJ mol^{-1}, log $A = 10.1$.	81TAT/KHU
72	9,10-Anthrasemiquinone-2,6-disulfonate anion + (RArNO$\cdot$) 							

TABLE 2. Reactions of phenoxyl radicals with other radicals ($R_1 + R_2 \rightarrow$ products, $-d[R_1]/dt = -d[R_2]/dt = k[R_1][R_2]$, values of k are tabulated)—Continued

No.	Phenoxyl + other radical Reaction	k (L mol^{-1} s^{-1})	pH	Solvent	T (K)	Method	Comments	Reference
	2,6-$(SO_3^-)_2$-9,10-An$(O^-)O\cdot$ + RArNO· →2,6-$(SO_3^-)_2$-9,10-An$(O)_2$ + RArNO$^-$	1.6×10^8		water/ n-PrOH	RT	f.p.	D.k. at 500 nm in deoxygenated soln. contg. 20% n-PrOH. E_a = 17.6 kJ mol^{-1} log A = 11.2.	81TAT/KHU
73	2,6-Di-tert-butyl-4-isopropylphenoxyl + 2,2-Diphenyl-1-picrylhydrazyl							
	2,6-$(t\text{-}Bu)_2$-4-(i-Pr)$C_6H_2O\cdot$ + DPPH·	0.7 1.3 2.5		benzene	293 313 333	Chem.	Kinetic ESR in deaerated soln. contg. DPPH· radicals and the phenol. E_a = 26 kJ mol^{-1}, log A = 4.5.	67AYS/RUS
74	Durosemiquinone anion + Triphenylverdazyl							
	$C_6(CH_3)_4(O^-)O\cdot$ + TPV–N· →$C_6(CH_3)_4(O)_2$ + TPV–N$^-$	5.9×10^5		water/ n-PrOH	RT	f.p.	D.k. at 500 nm in deoxygenated soln. contg. 20% n-PrOH.	81TAT/KHU
75	9,10-Anthrasemiquinone-2-sulfonate anion + Triphenylverdazyl							
	2-(SO_3^-)-9,10-An$(O^-)O\cdot$ + TPV–N· →2-(SO_3^-)-9,10-An$(O)_2$ + TPV–N$^-$	1.5×10^7		water/ n-PrOH	RT	f.p.	D.k. at 500 nm in deoxygenated soln. contg. 20% n-PrOH.	81TAT/KHU
76	9,10-Anthrasemiquinone-2,6-disulfonate anion + Triphenylverdazyl							
	2,6-$(SO_3^-)_2$-9,10-An$(O^-)O\cdot$TPV–N· →2,6-$(SO_3^-)_2$-9,10-An$(O)_2$ + TPV–N$^-$	3.8×10^7		water/ n-PrOH	RT	f.p.	D.k. at 500 nm in deoxygenated soln. contg. 20% n-PrOH.	81TAT/KHU
77	2,2,5,7,8-Pentamethylchroman-6-oxyl + Dihydrolipoic acid disulfide anion radical							
	HPMC· + $LS_2\cdot^-$	2.2×10^9	8.5	water	RT	p.r.	Decay and formn. kinetics in soln. contg. MeCN and N_3^-. Electron transfer.	94BOR/MIC
78	Trolox phenoxyl radical + Dihydrolipoic acid disulfide anion radical							
	TxO· + $LS_2\cdot^-$	4.4×10^8	8.5	water	RT	p.r.	D.k. and p.b.k. in soln. contg. MeCN and azide. Derived from fitting to a complex mechanism. Electron transfer.	94BOR/MIC
79	2,2,5,7,8-Pentamethylchroman-6-oxyl + glutathione disulfide radical anion							
	HPMC· + GSSG·$^-$	2.8×10^{10}	8.0– 8.5	water	RT	p.r.	D.k. and p.b.k. in soln. contg. MeCN and azide. Derived from fitting to a complex mechanism. Electron transfer.	94BOR/MIC
80	Trolox phenoxyl radical + glutathione disulfide radical anion							
	TxO· + GSSG·$^-$	1.5×10^9	8.0– 8.5	water	RT	p.r.	D.k. and p.b.k. in soln. contg. MeCN and azide. Derived from fitting to a complex mechanism. Electron transfer.	94BOR/MIC

TABLE 3. Reactions of phenoxyl radicals with inorganic compounds (in aqueous solution at room temperature, except where noted otherwise)

No.	Phenoxyl Reaction	k_f ($L\ mol^{-1}\ s^{-1}$)	k_r ($L\ mol^{-1}\ s^{-1}$)	pH	I	Method	Comments	Reference
1	4-Nitrophenoxyl							
	$4\text{-}O_2NC_6H_4O\cdot + 2\ SCN^- \rightleftarrows 4\text{-}O_2NC_6H_4O^- + (SCN)_2\cdot^-$	5.2×10^5 ($L^2\ mol^{-2}\ s^{-1}$)	1.4×10^7	11–12	0.5	p.r.	D.k. at 500 nm in N_2O-satd. soln.	90LIN/SHE
2	Phenoxyl							
	$C_6H_5O\cdot + ClO_2^- \rightleftarrows C_6H_5O^- + ClO_2\cdot$	6.3×10^4	1.6×10^7	13		p.r.	P.b.k. at 405 nm in N_2O-satd. soln.	88MER/LIN
		1.3×10^5	3.5×10^7	11–12	1.0	p.r.	Kinetics at 402 nm in N_2O-satd. soln.	90LIN/SHE
3	4-Methylphenoxyl							
	$4\text{-}CH_3C_6H_4O\cdot + ClO_2^- \rightleftarrows 4\text{-}CH_3C_6H_4O^- + ClO_2\cdot$	2×10^4	2.4×10^8	11–12	1.0	p.r.	Kinetics at 412 nm in N_2O-satd. soln.	90LIN/SHE
4	4-Acetylphenoxyl							
	$4\text{-}CH_3COC_6H_4O\cdot + ClO_2^- \rightleftarrows 4\text{-}CH_3COC_6H_4O^- + ClO_2\cdot$	1.2×10^7	1.4×10^6	11–12	1.0	p.r.	Kinetics at 445 nm in N_2O-satd. soln.	90LIN/SHE
5	4-Fluorophenoxyl							
	$4\text{-}FC_6H_4O\cdot + ClO_2^- \rightleftarrows 4\text{-}FC_6H_4O^- + ClO_2\cdot$	7×10^4	5.1×10^7	11–12	1.0	p.r.	Kinetics at 396 nm in N_2O-satd. soln.	90LIN/SHE
6	4-Chlorophenoxyl							
	$4\text{-}ClC_6H_4O\cdot + ClO_2^- \rightleftarrows 4\text{-}ClC_6H_4O^- + ClO_2\cdot$	9×10^4	2.5×10^7	11–12	0.2	p.r.	Kinetics at 420 nm in N_2O-satd. soln.	90LIN/SHE
7	4-Bromophenoxyl							
	$4\text{-}BrC_6H_4O\cdot + ClO_2^- \rightleftarrows 4\text{-}BrC_6H_4O^- + ClO_2\cdot$	1.8×10^5	1.7×10^7	11–12	0.2	p.r.	Kinetics at 430 nm in N_2O-satd. soln.	90LIN/SHE
8	4-Iodophenoxyl							
	$4\text{-}IC_6H_4O\cdot + ClO_2^- \rightleftarrows 4\text{-}IC_6H_4O^- + ClO_2\cdot$	2.8×10^5 1.9×10^5	3.5×10^7 2.8×10^7	11–12	0.2 1.0	p.r.	Kinetics at 500 nm in N_2O-satd. soln.	90LIN/SHE
9	Galvinoxyl							
	Galv-O· + Co(acac)$_2$ ⇄ Galv-OH + Co(III)	1.1				f.p.	D.k. at 432 nm in deoxygenated n-PrOH soln. contg. the phenol and $RuCl_3$ at 333 K. log A=12.5, Ea Ea= 79.5 kJ mol − 1.	79VOE/KHU
10	1,2-Benzosemiquinone							
	$1,2\text{-}C_6H_4(OH)O\cdot + Cu^{2+} \rightarrow$ complex	5×10^8		2.0		f.p.	D.k. at 350 nm in deoxygenated soln. Complex formed decays by a second order reaction with $2k=1.6\times10^6$ L mol^{-1} s^{-1}.	78KHU/KUZ
11	1,3-Benzosemiquinone							
	$1,3\text{-}C_6H_4(OH)O\cdot + Cu^{2+} \rightarrow$ complex	3.0×10^7		2.0		f.p.	D.k. at 420 nm in deoxygenated soln. Complex formed decays by a first order reaction with $k=3.0\times10^3\ s^{-1}$ to form Cu^+.	78KHU/KUZ
12	1,4-Benzosemiquinone anion							
	$1,4\text{-}C_6H_4(O^-)O\cdot + Cu^{2+} \rightarrow$ complex	6×10^8		7.0		f.p.	D.k. at 425 nm in deoxygenated soln. Complex formed decays by a second order reaction with $2k=1.6\times10^6$ L mol^{-1} s^{-1}.	78KHU/KUZ
13	5-Methyl-1,3-benzosemiquinone							
	$5\text{-}(CH_3)\text{-}1,3\text{-}C_6H_3(OH)O\cdot + Cu^{2+} \rightarrow$ complex	3.0×10^7		2.0		f.p.	D.k. at 450 nm in deoxygenated soln. Complex formed decays by a first order reaction with $k=3.0\times10^3\ s^{-1}$ to form Cu^+.	78KHU/KUZ
14	1,2-Naphthosemiquinone							
	$1,2\text{-}Np(OH)O\cdot + Cu^{2+} \rightarrow$ complex	3.2×10^6		2.0		f.p.	D.k. at 400 nm in deoxygenated soln.	78KHU/KUZ

TABLE 3. Reactions of phenoxyl radicals with inorganic compounds (in aqueous solution at room temperature, except where noted otherwise)—Continued

No.	Phenoxyl Reaction	k_f ($L\ mol^{-1}\ s^{-1}$)	k_r ($L\ mol^{-1}\ s^{-1}$)	pH	I	Method	Comments	Reference
15	9,10-Anthrasemiquinone-2,6-disulfonate anion $2,6\text{-}(SO_3^-)_2\text{-}9,10\text{-}An(O^-)O\cdot + Cu^{2+} \rightarrow$ complex	1.0×10^6		7.0		f.p.	D.k. at 400 nm in deoxygenated soln.	78KHU/KUZ
16	1,4-Benzosemiquinone $1,4\text{-}C_6H_4(OH)O\cdot + Fe^{2+} + H^+ \rightarrow 1,4\text{-}C_6H_4(OH)_2 + Fe^{3+}$	$\sim1.5\times10^5$		0		f.p.	D.k. at 415 nm at 293 K in deoxygenated soln. contg. 10% 2-PrOH. Observed decay includes radical–radical reactions; k derived from fitting to both reactions.	75KUZ/DAV
17	1,4-Benzosemiquinone $1,4\text{-}C_6H_4(OH)O\cdot + Fe^{3+} \rightarrow 1,4\text{-}C_6H_4(O)_2 + Fe^{2+} + H^+$	$\sim7\times10^5$		0		f.p.	D.k. at 415 nm at 293 K in deoxygenated soln. contg. 10% 2-PrOH. Observed decay includes radical–radical reactions; k derived from fitting to both reactions.	75KUZ/DAV
18	1,4-Benzosemiquinone anion $1,4\text{-}C_6H_4(O^-)O\cdot + Fe^{2+} + 2H^+ \rightarrow 1,4\text{-}C_6H_4(OH)_2 + Fe^{3+}$	4.3×10^5		4.6		f.p.	D.k. at 425 nm in deoxygenated soln. contg. 10% 2-PrOH at 293 K. ΔH $\Delta H = 15$ kJ mol−1, $\Delta S = -88\ J\ K^{-1}\ mol^{-1}$.	75KUZ/DAV
19	Phenoxyl $C_6H_5O\cdot + Fe(CN)_6^{4-}$	1×10^8				p.r.		02JON/LIN
20	4-Methoxyphenoxyl $4\text{-}CH_3OC_6H_4O\cdot + Fe(CN)_6^{4-} \rightleftarrows 4\text{-}CH_3OC_6H_4O^- + Fe(CN)_6^{3-}$	1.1×10^6	2.8×10^4	13.5		p.r.	D.k. at 420 nm in N_2O-satd. soln. contg. 0.9 mol L^{-1} ethylene glycol.	90JOV/STE
21	3,4-Dimethoxyphenoxyl $3,4\text{-}(CH_3O)_2C_6H_3O\cdot + Fe(CN)_6^{4-} \rightleftarrows [3,4\text{-}(CH_3O)_2C_6H_3O^- + Fe(CN)_6^{3-}$	6.5×10^5	2.7×10^4	13.5		p.r.	D.k. at 430 nm in N_2O-satd. soln.	91JOV/TOS
22	3,4-Methylenedioxyphenoxyl (Sesamoxyl) $Sesamol\text{-}O\cdot + Fe(CN)_6^{4-} \rightleftarrows Sesamol\text{-}O^- + Fe(CN)_6^{3-}$	8.2×10^5	2.4×10^5	13.5		p.r.	D.k. at 435 nm in N_2O-satd. soln.	91JOV/TOS
23	Tryptophan-5-oxyl $5\text{-}Trp\text{-}O\cdot + Fe(CN)_6^{4-} \rightleftarrows 5\text{-}Trp\text{-}O^- + Fe(CN)_6^{3-}$	2.7×10^4	1.6×10^6	13.5		p.r.	P.b.k. in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	90JOV/STE
		2.8×10^4	2.1×10^6	13.5		f.p.	P.b.k.	90JOV/STE
		2.8×10^6	2.5×10^4	9.1		p.r.	D.k. in N_2O-satd. soln. contg. 0.1 mol L^{-1} thiocyanate.	90JOV/STE
24	Tryptamine-5-oxyl $5\text{-}(O\cdot)\text{-}Tryptamine + Fe(CN)_6^{4-} \rightleftarrows 5\text{-}(O^-)\text{-}Tryptamine + Fe(CN)_6^{3-}$	1×10^5	5.9×10^6	13.5		f.p.	P.b.k.	90JOV/STE
25	Galvinoxyl (2,6-di-tert-butyl-α-(3,5-di-tert-butyl-4-oxo-2,5-cyclohexadien-1-ylidene)-p-tolyloxyl) $Galv\text{-}O\cdot + Fe(acac)_2 \rightarrow Galv\text{-}OH + Fe(III)$	6.0				f.p.	D.k. at 432 nm in deoxygenated n-PrOH soln. contg. the phenol and $RuCl_3$ at 333 K. $\log A = 9.1$, $E_a = 51.9\ kJ\ mol^{-1}$.	79VOE/KHU
26	Mitomycin C semiquinone anion $Mito(O^-)O\cdot + Fe(III)EDTA \rightarrow Mito(O)_2 + Fe(II)EDTA$	9.0×10^6		7.0		p.r.	D.k. at 510 nm in soln. contg. formate.	85BUT/HOE

TABLE 3. Reactions of phenoxyl radicals with inorganic compounds (in aqueous solution at room temperature, except where noted otherwise)—Continued

No.	Phenoxyl Reaction	k_f ($L\ mol^{-1}\ s^{-1}$)	k_r ($L\ mol^{-1}\ s^{-1}$)	pH	I	Method	Comments	Reference
27	Adriamycin semiquinone anion $Adria(O^-)O\cdot + Fe(III)EDTA \rightarrow Adria(O)_2 + Fe(II)EDTA$	2.8×10^8		7.0		p.r.	D.k. at 720 nm in soln. contg. formate.	85BUT/HOE
28	Mitomycin C semiquinone anion $Mito(O^-)O\cdot + Fe(III)DETAPAC \rightarrow Mito(O)_2 + Fe(II)DETAPAC$ (diethylenetriaminepentaacetate)	2.4×10^7		7.0		p.r.	D.k. at 510 nm in soln. contg. formate.	85BUT/HOE
29	Adriamycin semiquinone anion $Adria(O^-)O\cdot + Fe(III)DETAPAC \rightarrow Adria(O)_2 + Fe(II)DETAPAC$	7.0×10^8		7.0		p.r.	D.k. at 720 nm in soln. contg. formate.	85BUT/HOE
30	Mitomycin C semiquinone anion $Mito(O^-)O\cdot + Fe(III)desferrioxamine \rightarrow Mito(O)_2 + Fe(II)desferrioxamine$	$<6\times10^4$		7.0		p.r.	D.k. at 510 nm in soln. contg. formate.	85BUT/HOE
31	Adriamycin semiquinone anion $Adria(O^-)O\cdot + Fe(III)desferrioxamine$	$<4\times10^4$		7.0		p.r.	D.k. at 720 nm in soln. contg. formate.	85BUT/HOE
32	Mitomycin C semiquinone anion $Mito(O^-)O\cdot + Fe(III)ATP \rightarrow Mito(O)_2 + Fe(II)ATP$	$<6\times10^4$		7.0		p.r.	D.k. at 510 nm in soln. contg. formate.	85BUT/HOE
33	Adriamycin semiquinone anion $Adria(O^-)O\cdot + Fe(III)ATP \rightarrow Adria(O)_2 + Fe(II)ATP$	8×10^6		7.0		p.r.	D.k. at 720 nm in soln. contg. formate.	85BUT/HOE
34	2,5-Dimethyl-1,4-benzosemiquinone anion $2,5\text{-}(CH_3)_2\text{-}1,4\text{-}C_6H_2(O^-)O\cdot + methemoglobin(Fe^{III}) \rightarrow 2,5\text{-}(CH_3)_2\text{-}1,4\text{-}C_6H_2(O)_2 + methemoglobin(Fe^{II})$	3×10^5		7.2		p.r.	P.b.k. at 555 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH and 0.007 mol L^{-1} acetone.	82SUT/SAN
35	Durosemiquinone anion $C_6(CH_3)_4(O^-)O\cdot + methemoglobin(Fe^{III}) \rightarrow C_6(CH_3)_4(O)_2 + methemoglobin(Fe^{II})$	5.5×10^6		7.2		p.r.	P.b.k. at 555 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH and 0.007 mol L^{-1} acetone.	82SUT/SAN
36	2-Methyl-1,4-naphthosemiquinone anion $2\text{-}(CH_3)\text{-}1,4\text{-}Np(O^-)O\cdot + methemoglobin(Fe^{III}) \rightarrow 2\text{-}(CH_3)\text{-}1,4\text{-}Np(O)_2 + methemoglobin(Fe^{II})$	1.5×10^7		7.2		p.r.	P.b.k. at 555 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH and 0.007 mol L^{-1} acetone.	82SUT/SAN
37	9,10-Anthrasemiquinone-2-sulfonate anion $2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O^-)O\cdot + methemoglobin(Fe^{III}) \rightarrow 2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O)_2 + methemoglobin(Fe^{II})$	9×10^7		7.2		p.r.	P.b.k. at 555 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH and 0.007 mol L^{-1} acetone.	82SUT/SAN
38	2,5-Dimethyl-1,4-benzosemiquinone anion $2,5\text{-}(CH_3)_2\text{-}1,4\text{-}C_6H_2(O^-)O\cdot + Cyt\ C(Fe^{III}) \rightarrow 2,5\text{-}(CH_3)_2\text{-}1,4\text{-}C_6H_2(O)_2 + Cyt\ C(Fe^{II})$	1.0×10^7		7.2		p.r.	P.b.k. at 550 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH and 0.007 mol L^{-1} acetone.	82SUT/SAN
39	Durosemiquinone anion $C_6(CH_3)_4(O^-)O\cdot + Cyt\ C(Fe^{III}) \rightarrow C_6(CH_3)_4(O)_2 + Cyt\ C(Fe^{II})$	1.2×10^8		7.2		p.r.	P.b.k. at 550 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH and 0.007 mol L^{-1} acetone.	82SUT/SAN
40	2-Methyl-1,4-naphthosemiquinone anion $2\text{-}(CH_3)\text{-}1,4\text{-}Np(O^-)O\cdot + Cyt\ C(Fe^{III}) \rightarrow 2\text{-}(CH_3)\text{-}1,4\text{-}Np(O)_2 + Cyt\ C(Fe^{II})$	2.7×10^8		7.2		p.r.	P.b.k. at 550 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH and 0.007 mol L^{-1} acetone.	82SUT/SAN

TABLE 3. Reactions of phenoxyl radicals with inorganic compounds (in aqueous solution at room temperature, except where noted otherwise)—Continued

No.	Phenoxyl Reaction	k_f ($L\ mol^{-1}\ s^{-1}$)	k_r ($L\ mol^{-1}\ s^{-1}$)	pH	I	Method	Comments	Reference
41	9,10-Anthrasemiquinone-2-sulfonate anion 2-(SO_3^-)-9,10-An(O^-)O· + Cyt C(Fe^{III}) → 2-(SO_3^-)-9,10-An(O)$_2$ + Cyt C(Fe^{II})	1.9×10^9		7.2		p.r.	P.b.k. at 550 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH and 0.007 mol L^{-1} acetone.	82SUT/SAN
42	3,4-Dimethoxyphenoxyl + (N,N-Dimethylamino)methylferrocene 3,4-$(CH_3O)_2C_6H_3O$· + DMAMFc ⇄ 3,4-$(CH_3O)_2C_6H_3O^-$ + DMAMFc$^+$	2.9×10^7	8.7×10^5	7.0		p.r.	D.k. at 430 nm in N_2O-satd. soln.	91JOV/TOS
43	3,5-Dimethoxyphenoxyl + Ferrocenedicarboxylate anion 3,5-$(CH_3O)_2C_6H_3O$· + FcDC ⇄ 3,5-$(CH_3O)_2C_6H_3O^-$ + FcDC$^+$	1.1×10^9 7.0×10^8	6×10^5 2×10^6	7.0 8.0		p.r.	D.k. at 505 nm in N_2O-satd. soln.	91JOV/TOS
44	Methyl gallate semiquinone anion + Ferrocene monocarboxylate anion 3,4,5-(OH)(O^-)(O·)$C_6H_2CO_2CH_3$ + Fc(CO_2^-) ⇄ 3,4,5-$(OH)_3C_6H_2CO_2CH_3$ + Fc(CO_2^-)$^+$	1.9×10^6	4×10^5	7		p.r.	UV-vis kinetics in N_2O-satd. soln. contg. N_3^-.	95JOV/HAR
45	4-Cyanophenoxyl 4-NCC_6H_4O· + 2 I^- ⇄ 4-$NCC_6H_4O^-$ + I_2·$^-$	1×10^6 ($L^2\ mol^{-2}\ s^{-1}$)	7×10^4	11–12	1.0	p.r.	P.b.k. at 385 nm in N_2O-satd. soln.	90LIN/SHE
46	4-(4′-Hydroxyphenylthio)phenoxyl 4,4′-$HOC_6H_4SC_6H_4O$· + 2I^- ⇄ 4,4′-$HOC_6H_4SC_6H_4OH$ + I_2·$^-$	1.1×10^7 ($L^2\ mol^{-2}\ s^{-1}$)	1.1×10^8	≈7		p.r.	D.k. at 380 nm in N_2O-satd. soln.	99MOH/MIT
47	2-Methoxy-4-(2′-acetylvinyl)phenoxyl 2-(CH_3O)-4-$(CH_3COCH{=}CH)C_6H_3O$· + N_3^- ⇄ 2-(CH_3O)-4-$(CH_3COCH{=}CH)C_6H_3OH$ + N_3·	4.5×10^5	5.1×10^9	6		p.r.	P.b.k. at 360 nm in N_2O-satd. soln. contg. N_3^-.	99PRI/DEV
48	Tyrosyl TyrO· + O_2	$<1\times10^3$		9		p.r.	D.k. at 405 nm in N_2O-satd. soln. contg. azide and formate. Product analysis suggests reaction via addition.	93JIN/LEI
49	4-Acetaminophenoxyl 4-$CH_3CONHC_6H_4O$· + O_2	$<10^5$				p.r.	D.k.	88BIS/TAB
50	2,4,6-Tri-t-butylphenoxyl 2 (2,4,6-(t-Bu)$_3C_6H_2O$·) + O_2 → addition	4×10^2 ($L^2\ mol^{-2}\ s^{-1}$)				Chem.	Decay of ESR signal of the phenoxyl radical in benzene soln. at 347 K. log A = −14.5, Ea Ea = 114 kJ mol−1.	73GRI/DEN
51	α-Tocopheroxyl α-Toc-O· + O_2	≪6.5				f.p.	Kinetic ESR in benzene soln. contg. 9% di-t-butyl peroxide. No effect of O_2 up to the saturation level of 9.2 mmol L^{-1}.	84DOB/BUR
52	4-Methyl-1,2-benzosemiquinone anion 4-CH_3-1,2-(O^-)(O·)C_6H_3 + O_2 → 4-CH_3-1,2-(O)(O)C_6H_3 + O_2·$^-$	$\leq1\times10^5$		6.4		p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. azide.	88KAL/KOR
53	4-Methoxy-1,2-benzosemiquinone anion 4-(CH_3O)-1,2-$C_6H_3(O^-)$O· + O_2 ⇄ 4-(CH_3O)-1,2-$C_6H_3(O)_2$ + O_2·$^-$	$<10^5$	8.7×10^9	7.0		p.r.	D.k. in soln. contg. azide (for k_f); P.b.k. in soln. contg. formate and O_2 (for k_r).	88LAN
		$<10^5$	8.7×10^8	7.0		p.r.	D.k. at 320 nm in soln. contg. azide (for k_f); P.b.k. at 320 nm in soln. contg. formate and O_2 (for k_r).	87COO/LAN

TABLE 3. Reactions of phenoxyl radicals with inorganic compounds (in aqueous solution at room temperature, except where noted otherwise)—Continued

No.	Phenoxyl Reaction	k_f ($L\ mol^{-1}\ s^{-1}$)	k_r ($L\ mol^{-1}\ s^{-1}$)	pH	I	Method	Comments	Reference
54	3,4-Dihydroxyphenylalanine semiquinone anion $Dopa(O^-)(O\cdot)+O_2 \rightarrow Dopa(O)(O)+O_2\cdot^-$	$\leq 1\times10^5$		6.4		p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. azide.	88KAL/KOR
55	3,4-Dihydroxyphenethylamine semiquinone anion $Dopamine(O^-)(O\cdot)+O_2 \rightarrow Dopamine(O)(O)+O_2\cdot^-$	$\leq 1\times10^5$		6.4		p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. azide.	88KAL/KOR
56	Epinephrin semiquinone anion $Epinephrin(O^-)(O\cdot)+O_2 \rightarrow Epinephrin(O)(O)+O_2\cdot^-$	$\leq 1\times10^5$		6.4		p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. azide.	88KAL/KOR
57	5-S-Cysteinyldopa semiquinone anion $5\text{-}S\text{-}Cysteinyldopa(O^-)(O\cdot)+O_2 \rightarrow 5\text{-}S\text{-}Cysteinyldopa(O)(O)+O_2\cdot^-$	$\leq 1\times10^5$		6.4		p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. azide.	88KAL/KOR
58	2-Hydroxyestradiol semiquinone anion $2\text{-}Hydroxyestradiol(O^-)(O\cdot)+O_2 \rightarrow 2\text{-}Hydroxyestradiol(O)(O)+O_2\cdot^-$	$\leq 1\times10^5$		6.4		p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. azide.	88KAL/KOR
59	1,4-Benzosemiquinone anion $1,4\text{-}C_6H_4(O^-)O\cdot+O_2 \rightleftarrows 1,4\text{-}C_6H_4(O)_2+O_2\cdot^-$	5×10^4	1×10^9	7		p.r.	From equilibrium constant and k_r from 73PAT/WIL (p.b.k. at 430 nm in soln. contg. 2-PrOH).	75MEI
60	2-Methyl-1,4-benzosemiquinone anion $2\text{-}(CH_3)\text{-}1,4\text{-}C_6H_3(O^-)O\cdot+O_2 \rightleftarrows 2\text{-}(CH_3)\text{-}1,4\text{-}C_6H_3(O)_2+O_2\cdot^-$	1.1×10^6	7.6×10^8	7		p.r.	From equilibrium constant and k_r from 73PAT/WIL (p.b.k. at 430 nm in soln. contg. 2-PrOH).	75MEI
61	2-tert-Butyl-1,4-benzosemiquinone anion $2\text{-}(t\text{-}Bu)\text{-}1,4\text{-}C_6H_3(O^-)(O\cdot)+O_2 \rightleftarrows 2\text{-}(t\text{-}Bu)\text{-}1,4\text{-}C_6H_3O_2+O_2\cdot^-$	1.6×10^6	1.1×10^8	6.9	0.1	p.r.	P.b.k. at 430 nm in O_2-satd. soln. contg. formate.	95DOH/BER
62	2,3-Dimethyl-1,4-benzosemiquinone anion $2,3\text{-}(CH_3)_2\text{-}1,4\text{-}C_6H_2(O^-)O\cdot+O_2 \rightleftarrows 2,3\text{-}(CH_3)_2\text{-}1,4\text{-}C_6H_2(O)_2+O_2\cdot^-$	2.4×10^7	4.5×10^8	7		p.r.	From equilibrium constant and k_r from 73PAT/WIL (p.b.k. at 430 nm in soln. contg. 2-PrOH).	75MEI
63	2,5-Dimethyl-1,4-benzosemiquinone anion $2,5\text{-}(CH_3)_2\text{-}1,4\text{-}C_6H_2(O^-)O\cdot+O_2 \rightleftarrows 2,5\text{-}(CH_3)_2\text{-}1,4\text{-}C_6H_2(O)_2+O_2\cdot^-$	3.4×10^6	1.7×10^8	7		p.r.	P.b.k. at 430 nm in soln. contg. 2-PrOH and equilibrium constant.	75MEI
		4.8×10^6	1.7×10^8	7.2		p.r.	D.k. at 430 nm in deoxygenated soln. contg. formate.	76ILA/CZA
64	2,6-Dimethyl-1,4-benzosemiquinone anion $2,6\text{-}(CH_3)_2\text{-}1,4\text{-}C_6H_2(O^-)O\cdot+O_2 \rightleftarrows 2,6\text{-}(CH_3)_2\text{-}1,4\text{-}C_6H_2(O)_2+O_2\cdot^-$	8.8×10^6	2.2×10^8	7		p.r.	P.b.k. at 430 nm in soln. contg. 2-PrOH and equilibrium constant.	75MEI
65	2,5-Bis(carboethoxyamino)-3,6-diaziridinyl-1,4-benzosemiquinone anion $AZQ\cdot^- + O_2 \rightleftarrows AZQ + O_2\cdot^-$	1.1×10^7	2.7×10^8	7.0		p.r.	P.b.k. at ~500 nm in soln. contg. formate.	87BUT/HOE
66	2,5-Bis(2-hydroxyethylamino)-3,6-diaziridinyl-1,4-benzosemiquinone anion $BZQ\cdot^- + O_2 c[BZQ + O_2\cdot^-$	8.2×10^8	$\sim 1.5\times10^5$	7.0		p.r.	D.k. at ~500 nm in soln. contg. formate.	87BUT/HOE
67	Durosemiquinone anion $C_6(CH_3)_4(O^-)O\cdot+O_2 \rightleftarrows C_6(CH_3)_4(O)_2+O_2\cdot^-$	2.2×10^8	1.0×10^7	7		p.r.	D.k. at 445 nm in soln. contg. formate.	75MEI/CZA

TABLE 3. Reactions of phenoxyl radicals with inorganic compounds (in aqueous solution at room temperature, except where noted otherwise)—Continued

No.	Phenoxyl Reaction	k_f ($L\ mol^{-1}\ s^{-1}$)	k_r ($L\ mol^{-1}\ s^{-1}$)	pH	I	Method	Comments	Reference
		2.0×10^8	4.5×10^6	7		p.r.	D.k. at 440 nm in soln. contg. 5 mol L^{-1} 2-PrOH and 2 mol L^{-1} acetone.	73PAT/WIL
68	Mitomycin C semiquinone anion $Mito(O^-)O\cdot + O_2 \rightarrow Mito(O)_2 + O_2\cdot^-$	2.2×10^8		7.0		p.r.	D.k. at 510 nm in soln. contg. formate.	85BUT/HOE
69	5-Hydroxy-1,3-benzosequinone $5\text{-}(OH)\text{-}1,3\text{-}C_6H_3(OH)O\cdot + O_2$	$<4\times10^5$		2.5		p.r.	D.k. at 495 nm in N_2O/O_2-satd. soln.	94WAN/GYO
70	5-Hydroxy-1,3-benzosequinone anion $5\text{-}(OH)\text{-}1,3\text{-}C_6H_3(O^-)O\cdot + O_2$	2.1×10^8		6.9		p.r.	D.k. at 550 nm in N_2O/O_2-satd. sol. k derived from measured k (1.5×10^8) for mixture of unreactive neutral radical and anion radical and $pK_a = 6.5$. k at pH 10.5 is 1.4×10^8 but the reacting species is formulated as the keto form of the phenoxyl radical.	94WAN/GYO
71	2-Hydroxy-1,4-benzosemiquinone anion $1,2,4\text{-}C_6H_3(OH)(O^-)(O\cdot) + O_2 \rightarrow 1,2,4\text{-}C_6H_3(OH)(O)_2 + O_2\cdot^-$	2.5×10^6		6.4		p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. azide.	88KAL/KOR
72	2,4,5-Trihydroxyphenylalanine semiquinone anion $6\text{-Hydroxydopa}(O^-)(O\cdot) + O_2 \rightarrow 6\text{-Hydroxydopa}(O)(O) + O_2\cdot^-$	2.7×10^6		6.4		p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. azide.	88KAL/KOR
73	2,4,5-Trihydroxyphenethylamine semiquinone anion $6\text{-Hydroxydopamine}(O^-)(O\cdot) + O_2 \rightarrow 6\text{-Hydroxydopamine}(O)(O) + O_2\cdot^-$	8.3×10^6		6.4		p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. azide.	88KAL/KOR
74	1,4-Naphthosemiquinone $1,4\text{-Np}(OH)O\cdot + O_2 \rightarrow 1,4\text{-Np}(O)_2 + HO_2\cdot$	6.2×10^5				f.p.	D.k. at 370 nm in toluene/2-PrOH (9/1).	97TAT
		2.3×10^5				f.p.	D.k. at 370 nm in 2-PrOH.	97TAT
75	2-Methyl-1,4-naphthosemiquinone anion $2\text{-}(CH_3)\text{-}1,4\text{-Np}(O^-)O\cdot + O_2 \rightleftarrows 2\text{-}(CH_3)\text{-}1,4\text{-Np}(O)_2 + O_2\cdot^-$	2.4×10^8	3.8×10^7	7		p.r.	D.k. at 400 nm in soln. contg. formate.	75MEI/CZA
76	2,3-Dimethyl-1,4-naphthosemiquinone anion $2,3\text{-}(CH_3)_2\text{-}1,4\text{-Np}(O^-)O\cdot + O_2 \rightleftarrows 2,3\text{-}(CH_3)_2\text{-}1,4\text{-Np}(O)_2 + O_2\cdot^-$	2×10^8	4×10^6	neutral		p.r.	D.k. at 400 nm in soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone.	73PAT/WIL
77	2-Methyl-3-phytyl-1,4-naphthosemiquinone anion $2\text{-}(CH_3)\text{-}3\text{-phytyl-}1,4\text{-Np}(O^-)O\cdot + O_2 \rightleftarrows 2\text{-}(CH_3)\text{-}3\text{-phytyl-}1,4\text{-Np}(O)_2 + O_2\cdot^-$	2×10^8	$<2\times10^5$	neutral		p.r.	D.k. at 400 nm in soln. contg. 7 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone.	73PAT/WIL
78	5-Hydroxy-1,4-naphthosemiquinone anion $5\text{-}(OH)\text{-}1,4\text{-Np}(O^-)O\cdot + O_2 \rightleftarrows 5\text{-}(OH)\text{-}1,4\text{-Np}(O)_2 + O_2\cdot^-$	1.4×10^7	1.5×10^8	7		p.r.	P.b.k. at 385 nm in soln. contg. formate.	87MUK
79	5,8-Dihydroxy-1,4-naphthosemiquinone anion $1,4,5,8\text{-Np}(OH)_2(O^-)O\cdot + O_2 \rightleftarrows 1,4,5,8\text{-Np}(OH)_2(O)_2 + O_2\cdot^-$	1.1×10^8	5.8×10^8	5.2		p.r.	P.b.k. in soln. contg. formate.	83LAN/MUKa
	$1,4,5,8\text{-Np}(OH)(O^-)_2O\cdot + O_2 \rightarrow 1,4,5,8\text{-Np}(O^-)_2(O)_2 + O_2\cdot^-$	1.1×10^8		~14		p.r.	D.k. in soln. contg. formate.	83LAN/MUKa
80	Kalafungin semiquinone anion $KF\cdot^- + O_2 \rightleftarrows KF + O_2\cdot^-$	1.2×10^7	6.2×10^8	7		p.r.	Kinetics at 385 nm in soln. contg. 0.1 mol L^{-1} formate and O_2.	99AND/BRI

TABLE 3. Reactions of phenoxyl radicals with inorganic compounds (in aqueous solution at room temperature, except where noted otherwise)—Continued

No.	Phenoxyl Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	I	Method	Comments	Reference
81	5-Hydroxy-7-O-methylkalafungin semiquinone anion KF2$\cdot^- + O_2 \rightleftarrows$ KF2 $+ O_2\cdot^-$	8.7×10^7	1.6×10^8	7		p.r.	Kinetics at 395 nm in soln. contg. 0.1 mol L^{-1} formate and O_2.	99AND/BRI
82	5-Hydroxy-7-deoxykalafungin semiquinone anion KF3$\cdot^- + O_2 \rightleftarrows$ KF3 $+ O_2\cdot^-$	4×10^7	2.0×10^8	7		p.r.	Kinetics at 395 nm in soln. contg. 0.1 mol L^{-1} formate and O_2.	99AND/BRI
83	5-*epi*-7-O-Methylkalafungin semiquinone anion KF4$\cdot^- + O_2 \rightleftarrows$ KF4 $+ O_2\cdot^-$	1.6×10^8	8×10^7	7		p.r.	Kinetics at 385 nm in soln. contg. 0.1 mol L^{-1} formate and O_2.	99AND/BRI
84	5-*epi*-7-Deoxykalafungin semiquinone anion KF5$\cdot^- + O_2 \rightleftarrows$ KF5 $+ O_2\cdot^-$	5×10^7	1.4×10^8	7		p.r.	Kinetics at 385 nm in soln. contg. 0.1 mol L^{-1} formate and O_2.	99AND/BRI
85	9,10-Anthrasemiquinone 9,10-An(OH)O$\cdot + O_2 \rightarrow$ 9,10-An(O)$_2 + HO_2\cdot$	2.2×10^8				f.p.	D.k. at 375 nm in benzene soln. contg. 3.3% 2-PrOH. $k=2.0\times10^8$ with 5% 2-PrOH, $k=1.0\times10^8$ with 5% $(CD_3)_2CDOD$, $k_H/k_D=2.0$.	97TAT
		2.3×10^8				f.p.	D.k. at 375 nm in toluene.	97TAT
		9.2×10^7				f.p.	D.k. at 375 nm in toluene soln. contg. 7.5% 2-PrOH.	97TAT
		1.1×10^8				f.p.	D.k. at 375 nm in dioxane. $k=4.7\times10^7$ in dioxane-d_8, $k_H/k_D=2.4$.	97TAT
		1.0×10^8				f.p.	D.k. at 375 nm in dioxane soln. contg. 5% 2-PrOH. $k=4.0\times10^7$ with dioxane-d_8 and 5.6% $(CD_3)_2CDOD$, $k_H/k_D=2.6$.	97TAT
		1.5×10^8				f.p.	D.k. at 375 nm in chloroform.	97TAT
		9.5×10^7				f.p.	D.k. at 375 nm in chloroform soln. contg. 5% 2-PrOH. $k=8.1\times10^7$ in $CDCl_3$ with 5.6% $(CD_3)_2CDOD$, $k_H/k_D=1.2$.	97TAT
		1.1×10^8				f.p.	D.k. at 375 nm in ethyl acetate.	97TAT
		1.2×10^8				f.p.	D.k. at 375 nm in acetonitrile soln. contg. 5% 2-PrOH and 10^{-2} mol L^{-1} H_2SO_4. $k=1.1\times10^8$ with 5.7% 2-PrOH, $k=7.6\times10^7$ with 5.7% $(CD_3)_2CDOD$, $k_H/k_D=1.5$.	97TAT
		5.1×10^6				f.p.	D.k. at 375 nm in DMF soln. contg. 1.4% 2-PrOH and 10^{-2} mol L^{-1} H_2SO_4.	97TAT

TABLE 3. Reactions of phenoxyl radicals with inorganic compounds (in aqueous solution at room temperature, except where noted otherwise)—Continued

No.	Phenoxyl Reaction	k_f ($L\ mol^{-1}\ s^{-1}$)	k_r ($L\ mol^{-1}\ s^{-1}$)	pH	I	Method	Comments	Reference
		8.2×10^5				f.p.	D.k. at 375 nm in DMSO soln. contg. 1.8% 2-PrOH and 10^{-2} mol L^{-1} H_2SO_4.	97TAT
		3.9×10^6				f.p.	D.k. at 375 nm in pentanol soln. contg. 10^{-2} mol L^{-1} H_2SO_4.	97TAT
		3.8×10^6				f.p.	D.k. at 375 nm in 3-methyl-1-butanol soln. contg. 10^{-2} mol L^{-1} H_2SO_4.	97TAT
		2.8×10^6				f.p.	D.k. at 375 nm in 2-PrOH soln. contg. 10^{-2} mol L^{-1} H_2SO_4.	97TAT
		6×10^6				f.p.	D.k. at 375 nm in MeOH soln. contg. 10^{-2} mol L^{-1} H_2SO_4.	97TAT
		1.6×10^7				f.p.	D.k. at 375 nm in aqueous soln. contg. 14% 2-PrOH and 10^{-2} mol L^{-1} H_2SO_4.	97TAT
86	9,10-Anthrasemiquinone anion							
	9,10-An(O^-)O· + O_2 ⇄ 9,10-An(O)$_2$ + O_2·$^-$	3.2×10^8	3.2×10^6	alk.		p.r.	D.k. at 400 nm and 485 nm in MeOH.	90MAY/KRA
87	9,10-Anthrasemiquinone-1-sulfonate anion							
	1-(SO_3^-)-9,10-An(O^-)O· + O_2 → 1-(SO_3^-)-9,10-An(O)$_2$ + O_2·$^-$	4.2×10^8		7		p.r.	D.k. at 500 nm in soln. contg. formate.	72HUL/LAN
88	9,10-Anthrasemiquinone-2-sulfonate anion							
	2-(SO_3^-)-9,10-An(O^-)O· + O_2 → 2-(SO_3^-)-9,10-An(O)$_2$ + O_2·$^-$	4.6×10^8		7		p.r.	D.k. at 500 nm in soln. contg. formate.	72HUL/LAN
		1.7×10^9		7.0		p.r.	D.k. at 500 nm in soln. contg. formate.	91PAL/PALb
89	9,10-Anthrasemiquinone-1,5-disulfonate anion							
	1,5-(SO_3^-)$_2$-9,10-An(O^-)O· + O_2 → 1,5-(SO_3^-)$_2$-9,10-An(O)$_2$ + O_2·$^-$	1.4×10^9		8.4		p.r.	D.k. at 500 nm in soln. contg. formate.	91PAL/PALb
90	9,10-Anthrasemiquinone-2,6-disulfonate anion							
	2,6-(SO_3^-)$_2$-9,10-An(O^-)O· + O_2 → 2,6-(SO_3^-)$_2$-9,10-An(O)$_2$ + O_2·$^-$	6.0×10^8		7.0		p.r.	D.k. at 515 nm in soln. contg. formate.	91PAL/PALb
		5×10^8		neutral		p.r.	D.k. at 520 nm in soln. contg. 2-PrOH and acetone.	71WIL
91	1,4-Dihydroxy-9,10-anthrasemiquinone anion							
	1,4-(OH)$_2$-9,10-An(O^-)O· + O_2 ⇄ 1,4-(OH)$_2$-9,10-An(O)$_2$ + O_2·$^-$	1.5×10^7	$<10^5$	alk.		p.r.	D.k. at 395 nm in MeOH.	91MAY/KRA
		4.4×10^7		6.7		p.r.	D.k. at 480 nm in aqueous soln. contg. 5 mol L^{-1} 2-PrOH and 1 mol L^{-1} acetone.	90MUK/SWA
		3.7×10^7		11.1				
92	1,4-Dihydroxy-9,10-anthrasemiquinone-2-sulfonate anion							
	2-(SO_3^-)-1,4-(OH)$_2$-9,10-An(O^-)O· + O_2 → 2-(SO_3^-)-1,4-(OH)$_2$-9,10-An(O)$_2$ + O_2·$^-$	2.3×10^8		6.3		p.r.	D.k. at 385 nm in soln. contg. formate.	88MUK/LAN
		2.2×10^8		11.0				
93	Adriamycin semiquinone anion							
	Adria(O^-)O· + O_2 → Adria(O)$_2$ + O_2·$^-$	3.0×10^8		7.0		p.r.	D.k. at 720 nm in soln. contg. formate.	85BUT/HOE
		3.5×10^8		6.0		p.r.	D.k. at 720 nm in soln. contg. formate. pK_a of radical 2.9; pK_a's of adriamycin 8.2, 9.0, 9.4, 10.1, 13.2.	85LAN/MUK
		1.7×10^8		11.5				
94	5,5′-Indigodisulfonate radical anion							
	IDS(O^-)O· + O_2 ⇄ IDS(O)$_2$ + O_2·$^-$	3×10^7	9×10^5	7		p.r.	D.k. at 550 nm in soln. contg. formate.	75MEI/CZA
95	2,6-Diphenyl-4-octadecyloxyphenoxyl							

TABLE 3. Reactions of phenoxyl radicals with inorganic compounds (in aqueous solution at room temperature, except where noted otherwise)—Continued

No.	Phenoxyl Reaction	k_f ($L\ mol^{-1}\ s^{-1}$)	k_r ($L\ mol^{-1}\ s^{-1}$)	pH	I	Method	Comments	Reference
	2,6-Ph_2-4-$C_{18}H_{37}OC_6H_2O\cdot + 2Rh(III)$ $\rightarrow$products	4.6×10^6 ($L^2\ mol^{-2}\ s^{-1}$)				f.p.	D.k. at 405 nm in deoxygenated n-PrOH soln. contg. the phenol and $RhCl_3$ at 293 K.	79VOE/KHU
96	Galvinoxyl Galv-O$\cdot$ + Rh(III)$\rightarrow$products	3.9				f.p.	D.k. at 432 nm in deoxygenated n-PrOH soln. contg. the phenol and $RhCl_3$ at 333 K. $\log A=12.6$, $E_a=76.6\ kJ\ mol^{-1}$.	79VOE/KHU
97	2,6-Diphenyl-4-octadecyloxyphenoxyl 2,6-Ph_2-4-$C_{18}H_{37}OC_6H_2O\cdot + 2Ru(III)$ $\rightarrow$products	1.8×10^9 ($L^2\ mol^{-2}\ s^{-1}$)				f.p.	D.k. at 405 nm in deoxygenated n-PrOH soln. contg. the phenol and $RuCl_3$ at 293 K.	79VOE/KHU
98	Galvinoxyl Galv-O$\cdot$ + Ru(III)$\rightarrow$products	2.2×10^1				f.p.	D.k. at 432 nm in deoxygenated n-PrOH soln. contg. the phenol and $RuCl_3$ at 333 K. $\log A=9.0$, $E_a=47.7\ kJ\ mol^{-1}$.	79VOE/KHU
99	Phenoxyl $C_6H_5O\cdot + SO_3^{2-} \rightleftarrows C_6H_5O^- + SO_3\cdot^-$	1×10^7	6×10^5	11.1	0.1–0.5	p.r.	D.k. about 400 nm in N_2O-satd. soln.	84HUI/NET
100	4-Methoxyphenoxyl 4-$CH_3OC_6H_4O\cdot + SO_3^{2-}$	$<1\times10^6$		8		p.r.	D.k. at 420 nm.	95KHA/ALF
101	2-Chlorophenoxyl 2-$ClC_6H_4O\cdot + SO_3^{2-}$ $\rightarrow$2-$ClC_6H_4O^- + SO_3\cdot^-$	4.7×10^7		11	0.01	p.r.	D.k. about 400 nm in N_2O-satd. soln.	95KHA/NET
102	3-Chlorophenoxyl 3-$ClC_6H_4O\cdot + SO_3^{2-}$ $\rightarrow$3-$ClC_6H_4O^- + SO_3\cdot^-$	1.1×10^8		11	0.01	p.r.	D.k. about 400 nm in N_2O-satd. soln.	95KHA/NET
103	4-Chlorophenoxyl 4-$ClC_6H_4O\cdot + SO_3^{2-}$ $\rightarrow$4-$ClC_6H_4O^- + SO_3\cdot^-$	1.0×10^7		11	0.01	p.r.	D.k. about 400 nm in N_2O-satd. soln.	95KHA/NET
104	4-Bromophenoxyl 4-$BrC_6H_4O\cdot + SO_3^{2-}$ $\rightarrow$4-$BrC_6H_4O^- + SO_3\cdot^-$	1.2×10^7		11	0.01	p.r.	D.k. about 400 nm in N_2O-satd. soln.	95KHA/NET
105	2,3-Dichlorophenoxyl 2,3-$Cl_2C_6H_3O\cdot + SO_3^{2-}$ $\rightarrow$2,3-$Cl_2C_6H_3O^- + SO_3\cdot^-$	1.2×10^8		11	0.01	p.r.	D.k. about 400 nm in N_2O-satd. soln.	95KHA/NET
106	3,5-Dichlorophenoxyl 3,5-$Cl_2C_6H_3O\cdot + SO_3^{2-}$ $\rightarrow$3,5-$Cl_2C_6H_3O^- + SO_3\cdot^-$	3.4×10^8		11	0.01	p.r.	D.k. about 400 nm in N_2O-satd. soln.	95KHA/NET
107	2,6-Dichlorophenoxyl 2,6-$Cl_2C_6H_3O\cdot + SO_3^{2-}$ $\rightarrow$2,6-$Cl_2C_6H_3O^- + SO_3\cdot^-$	1.0×10^8		11	0.01	p.r.	D.k. about 400 nm in N_2O-satd. soln.	95KHA/NET
108	2,4,5-Trichlorophenoxyl 2,4,5-$Cl_3C_6H_2O\cdot + SO_3^{2-}$ $\rightarrow$2,4,5-$Cl_3C_6H_2O^-$ $+ SO_3\cdot^-$	1.4×10^8		11	0.01	p.r.	D.k. about 400 nm in N_2O-satd. soln.	95KHA/NET
109	Pentachlorophenoxyl $C_6Cl_5O\cdot + SO_3^{2-} \rightarrow C_6Cl_5O^-$ $+ SO_3\cdot^-$	1.5×10^8		11	0.01	p.r.	D.k. about 400 nm in N_2O-satd. soln.	95KHA/NET
110	Pentafluorophenoxyl $C_6F_5O\cdot + SO_3^{2-} \rightarrow C_6F_5O^- + SO_3\cdot^-$	4.4×10^8		11	0.01	p.r.	D.k. about 400 nm in N_2O-satd. soln.	95KHA/NET
111	2,4,6-Tri(tert-butyl)phenoxyl + Vanadyl acetylacetonate 2,4,6-$(t\text{-}Bu)_3C_6H_2O\cdot + VO(acac)_2$ $\rightarrow$Products	1.2×10^1				Chem.	Kinetic ESR in deoxygenated tert-butylbenzene soln.	81HOW/TAI

TABLE 3. Reactions of phenoxyl radicals with inorganic compounds (in aqueous solution at room temperature, except where noted otherwise)—Continued

No.	Phenoxyl Reaction	k_f ($L\ mol^{-1}\ s^{-1}$)	k_r ($L\ mol^{-1}\ s^{-1}$)	pH	I	Method	Comments	Reference
		7.0				Chem.	Kinetic ESR in deoxygenated 1,2-dichlorobenzene soln.	81HOW/TAI
		4.9				Chem.	Kinetic ESR in deoxygenated toluene soln. E_a=16.7 kJ mol^{-1}, log A=3.7. k increases to 1.2×10^2 in the presence of methanol.	81HOW/TAI
112	Galvinoxyl Galvinoxyl radical + $VO(acac)_2$ → Products	0.6				Chem.	Kinetic ESR in deoxygenated toluene soln. Rate constant increases to 22 in the presence of CH_3OH and to 4.6 in the presence of CH_3OD. The reaction is completely inhibited by pyridine.	81HOW/TAI

TABLE 4. Reactions of phenoxyl radicals with hydrocarbons, alcohols, olefins, fatty acid esters

No	Phenoxyl + reactant Reaction	k (L mol^{-1} s^{-1})	Solvent	T (K)	Method	Comments	Reference
1	2,6-Dimethylphenoxyl + tetralin 2,6-$(CH_3)_2C_6H_3O\cdot$ + Tetralin-H → 2,6-$(CH_3)_2C_6H_3OH$ + Tetralin·	$\approx 1.5\times10^{1}$	tetralin	338	therm.	Autoxidation of tetralin initiated by azo-bis-isobutyronitrile upon thermal decomposition and inhibited by the phenol.	65HOW/ING
2	Phenoxyl + 9,10-dihydroanthracene $C_6H_5O\cdot + AnH_2 \rightarrow C_6H_5OH + AnH\cdot$	1.1×10^{2}	PhCl	333	therm.	Chemical analysis. k derived from fitting to a complex mechanism.	75MAH/DAR
3	4-Methylphenoxyl + 9,10-dihydroanthracene 4-$CH_3C_6H_4O\cdot + AnH_2 \rightarrow$ 4-$CH_3C_6H_4OH$ + AnH·	9.9×10^{1}	PhCl	333	therm.	Chemical analysis. k derived from fitting to a complex mechanism.	75MAH/DAR
4	4-t-Butylphenoxyl + 9,10-dihydroanthracene 4-(t-Bu)$C_6H_4O\cdot + AnH_2$ → 4-(t-Bu)C_6H_4OH + AnH·	8.7×10^{1}	PhCl	333	therm.	Chemical analysis. k derived from fitting to a complex mechanism.	75MAH/DAR
5	4-Phenylphenoxyl + 9,10-dihydroanthracene 4-$C_6H_5C_6H_4O\cdot + AnH_2$ → 4-$C_6H_5C_6H_4OH$ + AnH·	1.2×10^{1}	PhCl	333	therm.	Chemical analysis. k derived from fitting to a complex mechanism.	75MAH/DAR
6	4-Methoxyphenoxyl + 9,10-dihydroanthracene 4-$CH_3OC_6H_4O\cdot + AnH_2$ → 4-$CH_3OC_6H_4OH$ + AnH·	3.7×10^{1}	PhCl	333	therm.	Chemical analysis. k derived from fitting to a complex mechanism.	75MAH/DAR
7	3-Carbethoxyphenoxyl + 9,10-dihydroanthracene 3-$(C_2H_5OCO)C_6H_4O\cdot + AnH_2$ → 3-$(C_2H_5OCO)C_6H_4OH$ + AnH·	1.6×10^{3}	PhCl	333	therm.	Chemical analysis. k derived from fitting to a complex mechanism.	75MAH/DAR
8	2,6-Dimethylphenoxyl + 9,10-dihydroanthracene 2,6-$(CH_3)_2C_6H_3O\cdot + AnH_2$ → 2,6-$(CH_3)_2C_6H_3OH$ + AnH·	7.8×10^{1}	PhCl	333	therm.	Chemical analysis. k derived from fitting to a complex mechanism.	75MAH/DAR
9	3,5-Di-t-butylphenoxyl + 9,10-dihydroanthracene 3,5-(t-Bu)$_2C_6H_3O\cdot + AnH_2$ → 3,5-(t-Bu)$_2C_6H_3OH$ + AnH·	1.8×10^{2}	PhCl	333	therm.	Chemical analysis. k derived from fitting to a complex mechanism.	75MAH/DAR
10	1-Naphthoxyl + 9,10-dihydroanthracene 1-Np-O· + $AnH_2 \rightarrow$ 1-Np-OH + AnH·	6.2×10^{1}	PhCl	333	therm.	Chemical analysis. k derived from fitting to a complex mechanism.	75MAH/DAR
11	2,6-Diphenyl-4-octadecyloxyphenoxyl + n-propanol 2,6-Ph_2-4-$C_{18}H_{37}OC_6H_2O\cdot$ + $CH_3CH_2CH_2OH$ → products	2.5×10^{-5}	n-PrOH	333	f.p.	D.k. at 405 nm in deoxygenated soln. contg. the phenol. log A=3.9, E_a=54.4 kJ mol^{-1}.	79VOE/KHU
12	Galvinoxyl + n-propanol Galv-O· + $CH_3CH_2CH_2OH$ → products	2.7×10^{-6}	n-PrOH	333	f.p.	D.k. at 432 nm in deoxygenated soln. log A=1.5, E_a=44.8 kJ mol^{-1}.	79VOE/KHU
13	2,4,6-Tri-tert-butylphenoxyl + 1,4-dioxane 2,4,6-(t-Bu)$_3C_6H_2O\cdot + C_4H_8O_2$ → 2,4,6-(t-Bu)$_3C_6H_2OH + \cdot C_4H_7O_2$	3×10^{-4}	CCl_4/p-dioxane	303	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	72MAH/DAR

TABLE 4. Reactions of phenoxyl radicals with hydrocarbons, alcohols, olefins, fatty acid esters—Continued

No	Phenoxyl+reactant Reaction	k (L mol^{-1} s^{-1})	Solvent	T (K)	Method	Comments	Reference
14	2,4,6-Tri-tert-butylphenoxyl+methyl methacrylate						
	2,4,6-(t-Bu)$_3$C$_6$H$_2$O· + methyl methacrylate → products	1.5×10^{-5} 3.5×10^{-5} 1.1×10^{-4} 2.4×10^{-4}	methyl methacrylate	333 343 353 363	chem.	Decay of ESR signal in deoxygenated soln. Phenoxyl radical formed by reaction of the phenol with ferricyanide. log A = 10.1, E_a = 95 kJ mol^{-1}.	92UTK/SOK
15	2,4,6-Tri-tert-butylphenoxyl+butyl acrylate						
	2,4,6-(t-Bu)$_3$C$_6$H$_2$O· + butyl acrylate → products	5.4×10^{-6} 1.3×10^{-5} 3.0×10^{-5} 6.3×10^{-5}	butyl acrylate	333 343 353 363	chem.	Decay of ESR signal in deoxygenated soln. Phenoxyl radical formed by reaction of the phenol with ferricyanide. log A = 7.68, E_a = 82.4 kJ mol^{-1}.	92UTK/SOK
16	2,4,6-tri-tert-butylphenoxyl+styrene						
	2,4,6-(t-Bu)$_3$C$_6$H$_2$O· + styrene → products	3.1×10^{-5} 8.0×10^{-5} 2.1×10^{-4}	styrene	323 333 343	chem.	Decay of ESR signal in deoxygenated soln. Phenoxyl radical formed by reaction of the phenol with ferricyanide. log A = 9.73, E_a = 88.3 kJ mol^{-1}.	92UTK/SOK
17	2,4,6-Tribromophenoxyl+styrene						
	2,4,6-Br$_3$C$_6$H$_2$O· + styrene → products	5×10^{-1}	styrene	323	chem.	Decay of the parent phenol in soln. contg. azoisobutyronitrile.	92UTK/SOK
18	Tetra(tert-butyl)indophenoxyl+tetracyanoethylene						
	TBIP-O· + (CN)$_2$C → C(CN)$_2$ → products	2.2×10^{-2}	THF	293	chem.	Decay of ESR signal of TBIP-O·. Radical produced by oxidation of TBIP-OH with PbO_2. log A=3.1, E_a = 28.5 kJ mol^{-1}.	79KHI/KOS
19	Galvinoxyl+tetracyanoethylene						
	Galv-O· + (CN)$_2$C → C(CN)$_2$ → products	3.6×10^{-5}	THF	293	chem.	Decay of ESR signal of TBIP-O·. Radical produced by oxidation of TBIP-OH with PbO_2. log A=3.68, E_a = 47.7 kJ mol^{-1}.	79KHI/KOS
20	5,7-Di-iso-propyltocoxyl+ethyl stearate						
	5,7-(i-Pr)$_2$-Toc-O· + ethyl stearate	$<1\times10^{-5}$	benzene	298	chem.	D.k. at 417 nm in deaerated soln.	90NAG/OKA
21	α-Tocopheroxyl+methyl oleate						
	α-Toc-O· + methyl oleate → α-Toc-OH+methyl oleate radical	$<3\times10^{-3}$	benzene	323	therm.	Steady-state ESR signal in deoxygenated soln. contg. the phenol, methyl linoleate, and di-tert-butyl hyponitrite.	91REM/ROG
22	5,7-Di-iso-propyltocoxyl+ethyloleate						
	5,7-(i-Pr)$_2$-Toc-O· + ethyl oleate → 5,7-(i-Pr)$_2$-Toc-OH+ethyl oleate radical	1.0×10^{-5}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	90NAG/OKA
		1.0×10^{-5}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	99MUK/OKAb
23	5,7-Diisopropyl-2,2-dimethylchroman-6-oxyl+methyl linoleate						
	DIDMC-O· + methyl linoleate → DIDMC-OH+methyl linoleate radical	1.8×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	93MUK/SAW

TABLE 4. Reactions of phenoxyl radicals with hydrocarbons, alcohols, olefins, fatty acid esters—Continued

No	Phenoxyl+reactant Reaction	k ($L\ mol^{-1}\ s^{-1}$)	Solvent	T (K)	Method	Comments	Reference
24	2,2,5,7,8-Pentamethylchroman-6-oxyl+methyl linoleate						
	PMC–O· + methyl linoleate (SH) → PMC–OH+S·	2.3×10^{-2}	EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
25	5,7-Diethyltocoxyl+methyl linoleate						
	5,7-Et_2-Toc-O· + methyl linoleate → 5,7-Et_2-Toc-OH+methyl linoleate radical	5.0×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	90NAG/OKA
26	5,7-Diisopropyltocoxyl+methyl linoleate						
	5,7-(i-Pr)$_2$-Toc-O· + methyl linoleate → 5,7-(i-Pr)$_2$-Toc-OH+methyl linoleate radical	1.9×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	90NAG/OKA
27	7-tert-Butyl-5-methyltocoxyl+methyl linoleate						
	7-t-Bu-5-Me-Toc-O· + methyl linoleate → 7-t-Bu-5-Me-Toc-OH+methyl linoleate radical	1.6×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	90NAG/OKA
28	7-tert-Butyl-5-isopropyltocoxyl+methyl linoleate						
	7-t-Bu-5-i-Pr-Toc-O· + methyl linoleate → 7-t-Bu-5-i-Pr-Toc-OH+methyl linoleate radical	1.1×10^{-3}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	90NAG/OKA
29	5,7-Diethyl-8-methyltocoxyl+methyl linoleate						
	5,7-Et_2-8-Me-Toc-O· + methyl linoleate → 5,7-Et_2-8-Me-Toc-OH+methyl linoleate radical	2.3×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	93MUK/SAW
30	5,7-Diisopropyl-8-methyltocoxyl+methyl linoleate						
	5,7-(i-Pr)$_2$-8-Me-Toc-O· + methyl linoleate → 5,7-(i-Pr)$_2$-8-Me-Toc-OH + methyl linoleate radical	3.3×10^{-3}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	93MUK/SAW
31	α-Tocopheroxyl+methyl linoleate						
	α-Toc-O· + methyl linoleate → α-Toc-OH+methyl linoleate radical	7.5×10^{-2}	benzene	323	therm.	Steady-state ESR signal in deoxygenated soln. contg. the phenol, methyl linoleate, and di-tert-butyl hyponitrite.	91REM/ROG
		2.7×10^{-2}	EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
32	2,3-Dihydro-2,2,4,6-tetramethylbenzo furan-5-oxyl+methyl linoleate						
	BOM–O· + methyl linoleate (SH) → BOM–OH+S·	2.4×10^{-1}	EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
33	2,3-Dihydro-2,2-dimethyl-4,6-diisopropylbenzofuran-5-oxyl+methyl linoleate						
	BF–O· + methyl linoleate →BF–OH+methyl linoleate radical	2.0×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	93MUK/SAW
34	2,3-Dihydro-2,2-dimethyl-4,6-di-tert-butylbenzofuran-5-oxyl+methyl linoleate						
	BOB–O· + methyl linoleate (SH) →BOB–OH+S·	2.5×10^{-3}	EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
35	2,3-Dihydro-2,2-dipentyl-4,6-di-tert-butylbenzofuran-5-oxyl+methyl linoleate						
	BO-653-O· + methyl linoleate (SH) →BO–653-OH+S·	2.8×10^{-3}	EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
36	5,7-Di-iso-propyltocoxyl+ethyl linoleate						
	5,7-(i-Pr)$_2$-Toc-O· + ethyl linoleate → 5,7-(i-Pr)$_2$-Toc-OH+ethyl linoleate radical	1.8×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	90NAG/OKA
		1.8×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	89MUK/OKAb
37	α-Tocopheroxyl+methyl linolenate						
	α-Toc-O· + methyl linolenate → α-Toc-OH+methyl linolenate radical	8.2×10^{-2}	benzene	323	therm.	Steady-state ESR signal in deoxygenated soln. contg. the phenol, methyl linoleate, and di-tert-butyl hyponitrite.	91REM/ROG
38	5,7-Di-iso-propyltocoxyl+ethyl linolenate						
	5,7-(i-Pr)$_2$-Toc-O· + ethyl linolenate → 5,7-(i-Pr)$_2$-Toc-OH+ethyl linolenate radical	3.8×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	90NAG/OKA

TABLE 4. Reactions of phenoxyl radicals with hydrocarbons, alcohols, olefins, fatty acid esters—Continued

No	Phenoxyl + reactant Reaction	k (L mol^{-1} s^{-1})	Solvent	T (K)	Method	Comments	Reference
		3.8×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	89MUK/OKAb
39	5,7-Di-iso-propyltocoxyl + ethyl arachidonate 5,7-(i-Pr)$_2$-Toc-O· + ethyl arachidonate → 5,7-(i-Pr)$_2$-Toc-OH + ethyl arachidonate radical	4.8×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	90NAG/OKA
		4.8×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	89MUK/OKAb
40	5,7-Di-iso-propyltocoxyl + ethyl cis-4,7,10,13,16,19-docosahexaenoate Toc-O· + ethyl docosahexaenoate →Toc-OH + ethyl docosahexaenoate radical	9.1×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	90NAG/OKA

TABLE 5. Reactions of phenoxyl radicals with amines, other nitrogen compounds, sulfur compounds

No.	Phenoxyl + amine Reaction	k (L mol^{-1} s^{-1})	Solvent (pH)	T (K)	Method	Comments	Reference
1	Galvinoxyl + diethylmethylamine Galvinoxyl· + $(C_2H_5)_2NCH_3$ → electron transfer	1.4×10^{-4}	toluene	307	chem.	Decay of the solvent aromatic proton NMR signal shift.	90SCR/HER
2	Galvinoxyl + triethylamine Galvinoxyl· + $(C_2H_5)_3N$ → electron transfer	1.7×10^{-4}	toluene	307	chem.	Decay of the solvent aromatic proton NMR signal shift.	90SCR/HER
3	Galvinoxyl + n-butyldimethylamine Galvinoxyl· + $CH_3CH_2CH_2CH_2N(CH_3)_2$ → electron transfer	9.6×10^{-5}	toluene	307	chem.	Decay of the solvent aromatic proton NMR signal shift.	90SCR/HER
4	Galvinoxyl + t-butyldimethylamine Galvinoxyl· + (t-Bu)$N(CH_3)_2$ → electron transfer	2.5×10^{-4}	toluene	307	chem.	Decay of the solvent aromatic proton NMR signal shift.	90SCR/HER
5	Galvinoxyl + tri(n-propyl)amine Galvinoxyl· + $(CH_3CH_2CH_2)_3N$ → electron transfer	2.1×10^{-4}	toluene	307	chem.	Decay of the solvent aromatic proton NMR signal shift.	90SCR/HER
6	Galvinoxyl + tri-n-butylamine Galvinoxyl· + $(CH_3CH_2CH_2CH_2)_3N$ → electron transfer	2.5×10^{-4}	toluene	307	chem.	Decay of the solvent aromatic proton NMR signal shift.	90SCR/HER
7	Galvinoxyl + tetramethylethylenediamine Galvinoxyl· + $(CH_3)_2NCH_2CH_2N(CH_3)_2$ → electron transfer	3.6×10^{-4}	toluene	307	chem.	Decay of the solvent aromatic proton NMR signal shift.	90SCR/HER
8	Tetra(tert-butyl)indophenoxyl + aniline TBIP–O· + $C_6H_5NH_2$ → TBIP–OH + C_6H_5NH·	4×10^{-2} 5.9×10^{-2} 8.7×10^{-2}	o-xylene	303 313 323	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2. $\log A=3.85$, $E_a=30.5$ kJ mol^{-1}.	66BID/POK
		3.7×10^{-2}	o-xylene	303	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66POK/BID
9	Tetra(tert-butyl)indophenoxyl + aniline-d2 TBIP–O· + $C_6H_5ND_2$ → TBIP–OH + C_6H_5ND·	2.4×10^{-2}	o-xylene	303	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66POK/BID
10	Tetra(tert-butyl)indophenoxyl + 4-methylaniline TBIP–O· + 4-$CH_3C_6H_4NH_2$ → TBIP–OH + 4-$CH_3C_6H_4NH$·	2.1×10^{-1}	o-xylene	303	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66POK/BID
11	Tetra(tert-butyl)indophenoxyl + 4-methoxyaniline TBIP–O· + 4-$CH_3OC_6H_4NH_2$ → TBIP–OH + 4-$CH_3OC_6H_4NH$·	1.9	o-xylene	303	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66POK/BID
12	Tetra(tert-butyl)indophenoxyl + 4-bromoaniline TBIP-O· + 4-$BrC_6H_4NH_2$ → TBIP–OH + 4-BrC_6H_4NH·	2.3×10^{-2}	o-xylene	303	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66POK/BID

TABLE 5. Reactions of phenoxyl radicals with amines, other nitrogen compounds, sulfur compounds—Continued

No.	Phenoxyl + amine Reaction	k (L mol^{-1} s^{-1})	Solvent (pH)	T (K)	Method	Comments	Reference
13	Galvinoxyl + N,N,-dimethylaniline Galvinoxyl· + $C_6H_5N(CH_3)_2$ → electron transfer	1.6×10^{-4}	toluene	307	chem.	Decay of the solvent aromatic proton NMR signal shift.	90SCR/HER
14	Tetra(tert-butyl)indophenoxyl + diphenylamine TBIP–O· + Ph_2NH → TBIP–OH + Ph_2N·	5.0×10^{-4} 7.4×10^{-4} 9.4×10^{-4}	o-xylene	303 313 323	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2. $\log A=1.30$, $E_a=26.8$ kJ mol^{-1}.	66BID/POK
15	Tetra(tert-butyl)indophenoxyl + diphenylamine-d TBIP–O· + Ph_2ND → TBIP–OH + Ph_2N·	4.8×10^{-4}	o-xylene	313	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66POK/BID
16	Tetra(tert-butyl)indophenoxyl + o-nitrodiphenylamine TBIP–O· + o-NO_2–Ph_2NH → TBIP-OH + o-NO_2–Ph_2N·	1.5×10^{-3}	o-xylene	323	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66BID/POK
17	Tetra(tert-butyl)indophenoxyl + m-nitrodiphenylamine TBIP–O· + m-NO_2-Ph_2NH → TBIP–OH + m-NO_2–Ph_2N·	2.1×10^{-3}	o-xylene	323	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66BID/POK
18	Tetra(tert-butyl)indophenoxyl + p-nitrodiphenylamine TBIP-O· + p-NO_2–Ph_2NH → TBIP–OH + p-NO_2–Ph_2N·	2.4×10^{-3}	o-xylene	323	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66BID/POK
19	4-Methoxyphenoxyl + 1,4-phenylenediamine 4-$CH_3OC_6H_4O$· + 4-$H_2NC_6H_4NH_2$ → 4-$CH_3OC_6H_4O^-$ + 4-$H_2NC_6H_4NH$·	6.6×10^{8}	water (13.5)	RT	p.r.	P.b.k. at 480 nm in N_2O-saturated solution containing 1 mol L^{-1} ethylene glycol. Reported k_{rev} probably incorrect.	79STE/NET
20	Tetra(tert-butyl)indophenoxyl + 1,4-phenylenediamine TBIP–O· + 4-$NH_2C_6H_4NH_2$ → TBIP–OH + 4-$NH_2C_6H_4NH$·	2.8	o-xylene	303	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66POK/BID
21	Phenoxyl + TMPD C_6H_5O· + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$ → $C_6H_5O^-$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$·$^+$	3.8×10^{9}	water (13.5)	RT	p.r.	P.b.k. at 565 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET
		5×10^{8}	CCl_4	RT	p.r.	P.b.k. at 572 nm in N_2-satd. soln. contg. 0.17 mol L^{-1} phenol.	84GRO/NET
22	4-Methoxyphenoxyl + TMPD 4-$CH_3OC_6H_4O$· + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$ → 4-$CH_3OC_6H_4O^-$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$·$^+$	2.2×10^{9}	water (13.5)	RT	p.r.	P.b.k. at 565 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET
		1.5×10^{9}	water (13.5)	293	p.r.	P.b.k. in N_2O-satd. soln. contg. 0.9 mol L^{-1} ethylene glycol.	90JOV/STE

TABLE 5. Reactions of phenoxyl radicals with amines, other nitrogen compounds, sulfur compounds—Continued

No.	Phenoxyl + amine Reaction	k (L mol^{-1} s^{-1})	Solvent (pH)	T (K)	Method	Comments	Reference
		1.5×10^{8}	CCl_4	RT	p.r.	P.b.k. at 572 nm in N_2-satd. soln. contg. 0.06 mol L^{-1} 4-methoxyphenol.	84GRO/NET
23	1,3-Benzosemiquinone anion + TMPD 3-$(O^-)C_6H_4O\cdot$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$ → 3-$(O^-)C_6H_4O^-$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2\cdot^+$	1.2×10^{9} 1.7×10^{9}	water (11.6) water (13.5)	RT	p.r.	P.b.k. at 565 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. k reported for reverse reaction probably incorrect.	79STE/NET
24	3,4-Methylenedioxyphenoxyl + TMPD sesamol-O· + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$ → sesamol-O^- + 4-$(CH_3)_2NC_6H_4N(CH_3)_2\cdot^+$	1.5×10^{9}	water (13.5)	293	p.r.	P.b.k. in N_2O-satd. soln.	91JOV/TOS
25	2,6-Dimethoxyphenoxyl + TMPD 2,6-$(CH_3O)_2C_6H_3O\cdot$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$ → 2,6-$(CH_3O)_2C_6H_3O$- + 4-$(CH_3)_2NC_6H_4N(CH_3)_2\cdot^+$	1.2×10^{9}	water (13.5)	293	p.r.	Kinetics in N_2O-satd. soln.	91JOV/TOS
26	Phenoxyl + NADH (nicotinamide adenine dinucleotide, reduced) $C_6H_5O\cdot$ + NADH → C_6H_5OH + NAD·	1.1×10^{8}	water (7–13.5)	RT	p.r.	Kinetics in N_2O-satd. soln.	83GRO/NET
27	4-Methoxyphenoxyl + NADH 4-$CH_3OC_6H_4O\cdot$ + NADH	$<1\times10^{5}$	water (7)	RT	p.r.	Kinetics in N_2O-satd. soln.	83GRO/NET
28	Trolox phenoxyl radical + NADH TxO· + NADH → TxOH + NAD·	$<1\times10^{5}$	water (7)	RT	p.r.	D.k. at 430 nm in N_2O-satd. soln. contg. azide.	88DAV/FOR
29	4-Aminophenoxyl + NADH 4-$NH_2C_6H_4O\cdot$ + NADH	$<1\times10^{5}$	water (7)	RT	p.r.	Kinetics in N_2O-satd. soln.	83GRO/NET
30	1,2-Benzosemiquinone + NADH 1,2-$C_6H_4(O^-)O\cdot$ + NADH	$<1\times10^{5}$	water (7)	RT	p.r.	Kinetics in N_2O-satd. soln.	83GRO/NET
31	1,3-Benzosemiquinone + NADH 1,3-$C_6H_4(OH)O\cdot$ + NADH → 1,3-$C_6H_4(OH)_2$ + NAD·	8×10^{6} $<1\times10^{5}$	water (7) water (9.3)	RT	p.r.	Kinetics in N_2O-satd. soln. for mixture of semiquinone neutral and anion. pK_a of 1,3-$C_6H_4(OH)O\cdot$=6.4 (86JIN/MAD).	83GRO/NET
32	1,4-Benzosemiquinone + NADH 1,4-$C_6H_4(O^-)O\cdot$ + NADH	$<1\times10^{5}$	water (7)	RT	p.r.	Kinetics in N_2O-satd. soln.	83GRO/NET
33	α-Tocopheroxyl + histamine α-Toc-O· + 2-(4-imidazolyl)ethylamine → products	1×10^{2}	n-BuOH	RT	chem.	Decay of ESR signal of α-tocopheroxyl radical, produced by reaction of α-tocopherol with DPPH, in the presence of various concentrations of histamine. Decay includes α-Toc-O· + α-Toc-O· and α-Toc-O· + histamine.	93OND/MIS
34	Phenoxyl + 2,2′-azinobis(3-ethylbenzothiazoline-6-sulfonate ion) (ABTS) $C_6H_5O\cdot$ + $ABTS^{2-}$ → $C_6H_5O^-$ + ABTS·$^-$	3.8×10^{9}	water	RT	p.r.	P.b.k. at 415 nm.	89NET/HUI
35	4-Methoxyphenoxyl + ABTS 4-$CH_3OC_6H_4O\cdot$ + $ABTS^{2-}$ → 4-$CH_3OC_6H_4OH$ + ABTS·$^-$	1.0×10^{7}	water (5.9)	RT	p.r.	P.b.k. at 415 nm. k much lower at pH 8.	95KHA/ALF
36	2,6-Di-tert-butyl-4-isopropylphenoxyl + 2,2-diphenyl-1-picrylhydrazine						

TABLE 5. Reactions of phenoxyl radicals with amines, other nitrogen compounds, sulfur compounds—Continued

No.	Phenoxyl + amine Reaction	k (L mol^{-1} s^{-1})	Solvent (pH)	T (K)	Method	Comments	Reference
	2,6-(t-Bu)$_2$-4-(i-Pr)$C_6H_2O\cdot$ + DPPH-H → 2,6-(t-Bu)$_2$-4-(i-Pr)C_6H_2OH + DPPH·	1.3 2.7 4.8	benzene	293 313 333	chem.	ESR kinetics in deaerated soln. contg. DPPH radicals and the phenol. log A=4.8, E_a = 26 kJ mol^{-1}. For reverse reaction k_r = 0.18 at 293 K, 0.39 at 313 K, 0.77 at 333 K.	67AYS/RUS
37	α-Tocopheroxyl + 3-methyl-1-[2-(2-naphthyloxy)ethyl]-2-pyrazolin-5-one						
	α-Toc-O· + nafazatrom → Products	3.1×10^3	n-BuOH	RT	chem.	Decay of ESR signal of α-tocopheroxyl, produced by reaction of α-tocopherol with DPPH, in the presence of various concentrations of nafazatrom. Decay includes α-Toc-O· + α-Toc-O· and α-Toc-O· + nafazatrom.	93OND/MIS
38	α-Tocopheroxyl + 2,8-dimethyl-2,3,4,4a,5,9b-hexahydro-1H-pyrido(4,3b)indole						
	α-Toc-O· + stobadine-OH → α-Toc-OH + stobadine-O·	2.5×10^2	n-BuOH	RT	chem.	Decay of ESR signal of α-tocopheroxyl radical, produced by reaction of α-tocopherol with DPPH, in the presence of various concentrations of stobadine. Decay includes α-Toc-O· + α-Toc-O· and α-Toc-O· + stobadine.	93OND/MIS
39	Trolox phenoxyl radical + cysteamine						
	TxO· + $NH_2CH_2CH_2SH$ → TxOH + $NH_2CH_2CH_2S\cdot$	$<1\times10^5$	water (7)	RT	p.r.	D.k. at 430 nm in N_2O-satd. soln. contg. azide.	88DAV/FOR
	TxO· + $NH_2CH_2CH_2S^-$ → TxO^- + $NH_2CH_2CH_2S\cdot$	$<1\times10^5$ 2×10^5	water (10) water (13)	RT	p.r.	D.k. at 430 nm in N_2O-satd. soln. contg. azide.	88DAV/FOR
40	2,2,5,7,8-Pentamethylchroman-6-oxyl + dihydrolipoic acid thiolate anion						
	HPMC· + L(SH)S^- → $LS_2\cdot^-$ + $HPMC^-$	5.1×10^2	water (8.5)	RT	p.r.	D.k. and p.b.k. in soln. contg. acetonitrile and azide. Derived from fitting to a complex mechanism.	94BOR/MIC
41	Trolox phenoxyl radical + dihydrolipoic acid thiolate anion						
	TxO· + L(SH)S^- → $LS_2\cdot^-$ + TxO^-	3.5×10^2	water (8.5)	RT	p.r.	D.k. and p.b.k. in soln. contg. acetonitrile and azide. Derived from fitting to a complex mechanism.	94BOR/MIC
42	α-Tocopheroxyl + glutathione						
	α-Toc-O· + GSH → α-Toc-OH + GS·	$\approx2.5\times10^1$	water (6.8)	RT	f.p.	D.k. at 430 nm in air satd. soln. contg. CTAC micelles.	91BIS/PAR

TABLE 6. Reactions of phenoxyl radicals with phenols

No.	Phenoxyl + phenol Reaction	k ($L\ mol^{-1}\ s^{-1}$)	Solvent (pH)	T (K)	log A	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
1	Phenoxyl + phenoxide $C_6H_5O\cdot + C_6H_5O^- \rightleftarrows C_6H_5O^- + C_6H_5O\cdot$ (self exchange)	1.9×10^8	water (11.5)	RT			e.r.	ESR line broadening of phenoxyl radical as a function of $[PhO^-]$ in N_2O-satd. soln. Self-exchange reaction.	76SCH/NET
2	4-Iodophenoxyl + phenoxide 4-$IC_6H_4O\cdot + C_6H_5O^-$ $\rightarrow$ 4-$IC_6H_4O^- + C_6H_5O\cdot$	6×10^8	water (11–12)	RT			p.r.	D.k. at 500 nm in N_2O-satd. soln. Electron transfer reaction. For reverse reaction $k_r = 1.6\times10^8$. $I = 0.1$.	90LIN/SHE
3	2,4,6-Tri-t-butylphenoxyl + phenol 2,4,6-$(t\text{-}Bu)_3C_6H_2O\cdot + C_6H_5OH$ $\rightarrow$ 2,4,6-$(t\text{-}Bu)_3C_6H_2OH + C_6H_5O\cdot$	6.2	benzene	297			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67DAR/MAH
		1.7×10^1	benzene	333			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67MAH/DAR
		3.8	benzene	303			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	72MAH/DAR
		8.5		333					
		1.6×10^1	PhCl	333			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67MAH/DAR
		4.1	PhCl	293	5.9	30.5	chem.	Decay of ESR signal in deaerated soln. Radical formed by photolysis of 2,4,6-tri-tert-butyl-4-bromocyclohexadienone.	76PRO/MAL
		5.7	hexane	297			chem.	Decay of ESR signal in deaerated soln. Radical formed by photolysis of 2,4,6-tri-tert-butyl-4-bromocyclohexadienone.	76PRO/MAL
		7.9	CCl_4	303			s.f.	D.k. at 400 or 630 nm in deoxygenated soln. k decreases upon increasing fraction of acetonitrile or p-dioxane as a co-solvent.	72MAH/DAR
		1.6×10^1		333					
4	Galvinoxyl + phenol Galvinoxyl$\cdot + C_6H_5OH$ $\rightarrow$ Galvinoxyl-H$+ C_6H_5O\cdot$	0.34	CCl_4	293		36.0	chem.	D.k. at 435 nm.	78NIS/OKA
		0.43		298					
		0.55		303					
		0.30	benzene	298			chem.	D.k. at 435 nm. Soln. satd. with H_2O.	78NIS/OKA
	Galvinoxyl$\cdot + C_6H_5OD$ $\rightarrow$ Galvinoxyl-D$+ C_6H_5O\cdot$	0.26	benzene	298			chem.	D.k. at 435 nm. Soln. satd. with D_2O.	78NIS/OKA
5	Tetra(tert-butyl)indophenoxyl + phenol TBIP-O$\cdot + C_6H_5OH$ $\rightarrow$ TBIP-OH$+ C_6H_5O\cdot$	0.08	o-xylene	303	6.49	43.9	chem.	Decay of ESR signal of TBIP–O$\cdot$. Radical produced by oxidation of TBIP–OH with PbO_2.	66BID/POK
		0.14		313					
		0.23		323					
6	Galvinoxyl + 4-methylphenol Galvinoxyl$\cdot$ + 4-$CH_3C_6H_4OH$ $\rightarrow$ Galvinoxyl-H + 4-$CH_3C_6H_4O\cdot$	5.3	CCl_4	293		31.0	chem.	D.k. at 435 nm.	78NIS/OKA
		6.7		298					
		8.0		303					
7	Tetra(tert-butyl)indophenoxyl + 4-methylphenol TBIP–O$\cdot$ + 4-$CH_3C_6H_4OH$ $\rightarrow$ TBIP–OH + 4-$CH_3C_6H_4O\cdot$	0.08	o-xylene	303			chem.	Decay of ESR signal of TBIP–O$\cdot$. Radical produced by oxidation of TBIP–OH with PbO_2.	66BID/POK
8	2,4,6-Tri-t-butylphenoxyl + 3-tert-butylphenol 2,4,6-$(t\text{-}Bu)_3C_6H_2O\cdot$ + 3-$(t\text{-}Bu)C_6H_4OH$ $\rightarrow$ 2,4,6-$(t\text{-}Bu)_3C_6H_2OH$ + 3-$(t\text{-}Bu)C_6H_4O\cdot$	2.1×10^1	benzene	297			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67DAR/MAH

TABLE 6. Reactions of phenoxyl radicals with phenols—Continued

No.	Phenoxyl + phenol Reaction	k ($L\ mol^{-1}\ s^{-1}$)	Solvent (pH)	T (K)	log A	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
9	2,4,6-Tri-t-butylphenoxyl + 4-tert-butylphenol								
	2,4,6-$(t\text{-Bu})_3C_6H_2O\cdot$ + 4-$(t\text{-Bu})C_6H_4OH$ → 2,4,6-$(t\text{-Bu})_3C_6H_2OH$ + 4-$(t\text{-Bu})C_6H_4O\cdot$	9.3×10^1	benzene	297			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67DAR/MAH
		2.5×10^2	benzene	333			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67MAH/DAR
		4.9×10^1	benzene	303			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	72MAH/DAR
		1.3×10^2		333					
		2.2×10^2	PhCl	333			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67MAH/DAR
		5.1×10^1	PhCl	303	5.3	21	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	70MAH/DARa
		6.7×10^1		313					
		1.1×10^2		333					
		9.5×10^1	CCl_4	303			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	72MAH/DAR
		2.2×10^2		333					
10	Galvinoxyl + 4-t-butylphenol								
	Galvinoxyl· + 4-$(t\text{-Bu})C_6H_4OH$ → Galvinoxyl-H + 4-$(t\text{-Bu})C_6H_4O\cdot$	6.8	benzene	298			chem.	D.k. at 435 nm. Soln. satd. with H_2O.	78NIS/OKA
	Galvinoxyl· + 4-$(t\text{-Bu})C_6H_4OD$ → Galvinoxyl-D + 4-$(t\text{-Bu})C_6H_4O\cdot$	3.2	benzene	298			chem.	D.k. at 435 nm. Soln. satd. with D_2O.	78NIS/OKA
11	2,4,6-Tri-t-butylphenoxyl + 4-phenylphenol								
	2,4,6-$(t\text{-Bu})_3C_6H_2O\cdot$ + 4-$C_6H_5C_6H_4OH$ → 2,4,6-$(t\text{-Bu})_3C_6H_2OH$ + 4-$C_6H_5C_6H_4O\cdot$	2.5×10^2	benzene	297			s.f.	D.k. at 400 or 630 nm in deoxygenated soln. Isotope effect for OH deuteriated phenol phenol > 7.5.	67DAR/MAH
12	2,4,6-Tri-t-butylphenoxyl + 3-cyanophenol								
	2,4,6-$(t\text{-Bu})_3C_6H_2O\cdot$ + 3-NCC_6H_4OH → 2,4,6-$(t\text{-Bu})_3C_6H_2OH$ + 3-$NCC_6H_4O\cdot$	0.16	benzene	297			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67DAR/MAH
13	2,4,6-Tri-t-butylphenoxyl + 4-cyanophenol								
	2,4,6-$(t\text{-Bu})_3C_6H_2O\cdot$ + 4-NCC_6H_4OH → 2,4,6-$(t\text{-Bu})_3C_6H_2OH$ + 4-$NCC_6H_4O\cdot$	0.15	benzene	297			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67DAR/MAH
14	Galvinoxyl + 4-cyanophenol								
	Galvinoxyl· + 4-NCC_6H_4OH → Galvinoxyl-H + 4-$NCC_6H_4O\cdot$	7.3×10^{-3}	CCl_4	293		63.2	chem.	D.k. at 435 nm.	78NIS/OKA
		9.3×10^{-3}		298					
		1.7×10^{-2}		303					
15	2,4,6-Tri-t-butylphenoxyl + 4-carbomethoxyphenol								
	2,4,6-$(t\text{-Bu})_3C_6H_2O\cdot$ + 4-$(CH_3OCO)C_6H_4OH$ → 2,4,6-$(t\text{-Bu})_3C_6H_2OH$ + 4-$(CH_3OCO)C_6H_4O\cdot$	0.42	benzene	297			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67DAR/MAH
16	2,4,6-Tri-t-butylphenoxyl + 3-carbethoxyphenol								
	2,4,6-$(t\text{-Bu})_3C_6H_2O\cdot$ + 3-$(C_2H_5OCO)C_6H_4OH$ → 2,4,6-$(t\text{-Bu})_3C_6H_2OH$ + 3-$(C_2H_5OCO)C_6H_4O\cdot$	1.2	benzene	297			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67DAR/MAH
		0.59	benzene	303			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	72MAH/DAR
		1.4		333					
		0.43	PhCl	303	4.8	30	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	70MAH/DARa
		0.76		313					
		1.3		333					
		1.8	CCl_4	303			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	72MAH/DAR
		4.6		333					
17	Galvinoxyl + 4-acetyloxyphenol								
	Galvinoxyl· + 4-$(CH_3COO)C_6H_4OH$ → Galvinoxyl-H + 4-$(CH_3COO)C_6H_4O\cdot$	0.031	CCl_4	293		60.2	chem.	D.k. at 435 nm.	78NIS/OKA
		0.044		298					
		0.071		303					
18	2,4,6-Tri-t-butylphenoxyl + 4-methoxyphenol								
	2,4,6-$(t\text{-Bu})_3C_6H_2O\cdot$ + 4-$CH_3OC_6H_4OH$ → 2,4,6-$(t\text{-Bu})_3C_6H_2OH$ + 4-$CH_3OC_6H_4O\cdot$	6.1×10^3	benzene	297			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67DAR/MAH
19	Galvinoxyl + 4-methoxyphenol								
	Galvinoxyl· + 4-$CH_3OC_6H_4OH$ →	4.2×10^2	CCl_4	293		23.0	chem.	D.k. at 435 nm.	78NIS/OKA

TABLE 6. Reactions of phenoxyl radicals with phenols—Continued

No.	Phenoxyl + phenol Reaction	k ($L\ mol^{-1}\ s^{-1}$)	Solvent (pH)	T (K)	log A	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
	Galvinoxyl-H + 4-$CH_3OC_6H_4O\cdot$	4.9×10^2		298					
		5.7×10^2		303					
		5.5×10^2	benzene	298			chem.	D.k. at 435 nm. Soln. satd. with H_2O.	78NIS/OKA
	Galvinoxyl$\cdot$ + 4-$CH_3OC_6H_4OD$ → Galvinoxyl-D + 4-$CH_3OC_6H_4O\cdot$	1.6×10^2	benzene	298			chem.	D.k. at 435 nm. Soln. satd. with D_2O.	78NIS/OKA
20	3-hydroxy-5-methoxyphenoxyl + 4-methoxyphenol								
	3,5-(OH)(O$\cdot$)$C_6H_3OCH_3$ + 4-$CH_3OC_6H_4OH$ → 3,5-$(OH)_2C_6H_3OCH_3$ + 4-$CH_3OC_6H_4O\cdot$	6.4×10^6	water (7)	293			p.r.	Kinetics in N_2O-satd. soln. contg. N_3^-. For reverse reaction $k_r = 1.4\times10^5$.	95JOV/HAR
21	Galvinoxyl + 4-nitrophenol								
	Galvinoxyl$\cdot$ + 4-$O_2NC_6H_4OH$ → Galvinoxyl-H + 4-$O_2NC_6H_4O\cdot$	3.4×10^{-3}	CCl_4	298			chem.	D.k. at 435 nm.	78NIS/OKA
22	Tetra(tert-butyl)indophenoxyl + 4-nitrophenol								
	TBIP-O$\cdot$ + 4-$NO_2C_6H_4OH$ → TBIP-OH + 4-$NO_2C_6H_4O\cdot$	8×10^{-2}	o-xylene	303			chem.	Decay of ESR signal of TBIP–O$\cdot$. Radical produced by oxidation of TBIP–OH with PbO_2.	66BID/POK
23	Galvinoxyl + 4-fluorophenol								
	Galvinoxyl$\cdot$ + 4-FC_6H_4OH → Galvinoxyl-H + 4-$FC_6H_4O\cdot$	1.1	CCl_4	293		41.0	chem.	D.k. at 435 nm.	78NIS/OKA
		1.5		298					
		2.0		303					
24	Galvinoxyl + 4-chlorophenol								
	Galvinoxyl$\cdot$ + 4-ClC_6H_4OH → Galvinoxyl-H + 4-$ClC_6H_4O\cdot$	4.3×10^{-3}	p-dioxane	293		59.4	chem.	D.k. at 435 nm. Rate constants are reported for various mixtures of dioxane and cyclohexane.	78NIS/OKA
		6.2×10^{-3}		298					
		9.6×10^{-3}		303					
		1.3	cyclohexane	293		36.2	chem.	D.k. at 435 nm. Rate constants are reported for various mixtures of dioxane and cyclohexane.	78NIS/OKA
		1.6		298					
		2.1		303					
25	Phenoxyl + 4-bromophenoxide								
	$C_6H_5O\cdot$ + 4-$BrC_6H_4O^-$ → $C_6H_5O^-$ + 4-$BrC_6H_4O\cdot$	2.0×10^8	water (11.5)	RT			p.r.	Formn. at 430 nm as a function of 4-bromophenoxide ion concentration in N_2-satd. soln. contg. 0.2 mol L^{-1} t-BuOH.	76SCH/NET
26	2,4,6-Tri-t-butylphenoxyl + 4-bromophenol								
	2,4,6-$(t\text{-Bu})_3C_6H_2O\cdot$ + 4-BrC_6H_4OH → 2,4,6-$(t\text{-Bu})_3C_6H_2OH$ + 4-$BrC_6H_4O\cdot$	8.7	benzene	297			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67DAR/MAH
		5.4	PhCl	303	6.2	32	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	70MAH/DARa
		7.5		313					
		16		333					
		4.7	PhCl	293	5.8	28.9	chem.	Decay of ESR signal in deaerated soln. Radical formed by photolysis of 2,4,6-tri-tert-butyl-4-bromocyclohexadienone.	76PRO/MAL
27	Galvinoxyl + 4-bromophenol								
	Galvinoxyl$\cdot$ + 4-BrC_6H_4OH → Galvinoxyl-H + 4-$BrC_6H_4O\cdot$	0.65	CCl_4	293		43.0	chem.	D.k. at 435 nm.	78NIS/OKA
		0.76		298					
		1.2		303					
28	2,4,6-Tri-t-butylphenoxyl + 3,5-dimethylphenol								
	2,4,6-$(t\text{-Bu})_3C_6H_2O\cdot$ + 3,5-$(CH_3)_2C_6H_3OH$ → 2,4,6-$(t\text{-Bu})_3C_6H_2OH$ + 3,5-$(CH_3)_2C_6H_3O\cdot$	3.1×10^1	benzene	297			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67DAR/MAH
		1.8×10^1	benzene	303			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	72MAH/DAR
		5.7×10^1		333					

TABLE 6. Reactions of phenoxyl radicals with phenols—Continued

No.	Phenoxyl + phenol Reaction	k ($L\ mol^{-1}\ s^{-1}$)	Solvent (pH)	T (K)	log A	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
		1.6×10^{1}	PhCl	303	6.2	29	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	70MAH/DARa
		2.9×10^{1}		313					
		4.7×10^{1}		333					
		3.9×10^{1}	CCl_4	303			s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	72MAH/DAR
		7.4×10^{1}		333					
29	2,4,6-Tri-tert-butylphenoxyl + 2,6-di-tert-butylphenol								
	2,4,6-(t-Bu)$_3$-$C_6H_2O\cdot$ + 2,6-(t-Bu)$_2$-C_6H_3OH → 2,4,6-(t-Bu)$_3$-C_6H_2OH + 2,6-(t-Bu)$_2$-$C_6H_3O\cdot$	5.4×10^{1}	hexane	293	3.3	10.5	chem.	Decay of ESR signal in deaerated soln. Radical formed by photolysis of 2,4,6-tri-tert-butyl-4-bromocyclohexadienone.	76PRO/MAL
30	Tetra(tert-butyl)indophenoxyl + 2,6-di-tert-butylphenol								
	TBIP-O· + 2,6-(t-Bu)$_2$-C_6H_3OH → TBIP–OH + 2,6-(t-Bu)$_2$-$C_6H_3O\cdot$	3.1	o-xylene	303			chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66BID/POK
31	Lysozyme tyrosyl radical + 3,4-methylenedioxyphenol								
	Lys-TyrO· + sesamol-OH → Lys-TyrOH + sesamol-O·	9.3×10^{6}	water/ micelles (7)	RT			p.r.	D.k. at 405 nm in N_2O-satd. soln. contg. azide and SDS micelles.	84HOE/BUT
32	2,4,6-Tri-tert-butylphenoxyl + 2,6-di-tert-butyl-4-methylphenol								
	2,4,6-(t-Bu)$_3$-$C_6H_2O\cdot$ + 2,6-(t-Bu)$_2$-4-MeC_6H_2OH → 2,4,6-(t-Bu)$_3$-C_6H_2OH + 2,6-(t-Bu)$_2$-4-Me$C_6H_2O\cdot$	3.4×10^{2}	hexane	293	2.5	3.3	chem.	Decay of ESR signal in deaerated soln. Radical formed by photolysis of 2,4,6-tri-tert-butyl-4-bromocyclohexadienone.	76PRO/MAL
33	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 2,6-di-tert-butyl-4-methylphenol								
	MPP–O· + 2,6-(t-Bu)$_2$-4-MeC_6H_2OH → MPP–OH + 2,6-(t-Bu)$_2$-4-Me$C_6H_2O\cdot$	4.8×10^{1}	benzene/ EtOH (2/1)	298			s.f.	D.k. at 375 and 580 nm in deaerated soln.	89MUK/NISa
34	Tetra(tert-butyl)indophenoxyl + 2,6-di-tert-butyl-4-methylphenol								
	TBIP–O· + 2,6-(t-Bu)$_2$-4-Me-C_6H_2OH → TBIP–OH + 2,6-(t-Bu)$_2$-4-Me-$C_6H_2O\cdot$	1.0	o-xylene	303	3.84	23.0	chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66BID/POK
		1.2		313					
		1.4		323					
35	Tetra(tert-butyl)indophenoxyl + 2,6-di-tert-butyl-4-ethylphenol								
	TBIP-O· + 2,6-(t-Bu)$_2$-4-Et-C6H2OH → TBIP–OH + 2,6-(t-Bu)$_2$-4-Et-$C_6H_2O\cdot$	0.55	o-xylene	303			chem.	Decay of ESR signal of TBIP–O·. Radical produced by oxidation of TBIP–OH with PbO_2.	66BID/POK
36	2,4,6-Tri(tert-butyl)phenoxyl + 2,4,6-Tri(tert-butyl)-3,5-dideuteriophenol								
	2,4,6-(t-Bu)$_3C_6H_2O\cdot$ + 2,4,6-(t-Bu)$_3C_6D_2OH$ → 2,4,6-(t-Bu)$_3C_6H_2OH$ + 2,4,6-(t-Bu)$_3C_6D_2O\cdot$	2.2×10^{2}	CCl_4	294			s.f.	Kinetic ESR in deoxygenated soln. Deuterium isotope effect $k_{(OH)}/k_{(OD)} = 1.24$.	68ARI/WEI
37	2,4,6-Tri-tert-butylphenoxyl + 2,4,6-trichlorophenol								
	2,4,6-(t-Bu)$_3C_6H_2O\cdot$ + 2,4,6-Cl$_3C_6H_2OH$ → 2,4,6-(t-Bu)$_3C_6H_2OH$ + 2,4,6-Cl$_3C_6H_2O\cdot$	2.7	PhCl	303	4.6	24	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	70MAH/DARa
		4.0		313					
		6.4		333					
38	Phenoxyl + α-naphthol								
	$C_6H_5O\cdot$ + α-NpOH → C_6H_5OH + α-NpO·	2.3×10^{7}	t-Bu_2O_2/ benzene(3/1)				f.p.	P.b.k. at 510 nm in deoxygenated soln. contg. 1.4 mol L^{-1} phenol.	94FOT/ING
39	Phenoxyl + β-naphthol								
	$C_6H_5O\cdot$ + β-NpOH → C_6H_5OH + β-NpO·	4.5×10^{6}	t-Bu_2O_2/ benzene(3/1)				f.p.	P.b.k. at 470 nm in deoxygenated soln. contg. 1.4 mol L^{-1} phenol.	94FOT/ING

TABLE 6. Reactions of phenoxyl radicals with phenols—Continued

No.	Phenoxyl + phenol Reaction	k ($L\ mol^{-1}\ s^{-1}$)	Solvent (pH)	T (K)	$\log A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
40	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 6-hydroxy-2,2-dimethylchromane MPP–O· + DMC–OH → MPP–OH + DMC–O·	4.1×10^{2}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	87MUK/YOK
41	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 6-hydroxy-2,2,8-trimethylchromane MPP–O· + TMC–OH → MPP–OH + TMC–O·	1.0×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	87MUK/YOK
42	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 6-hydroxy-2,2-dimethyl-7-tert-butylchromane MPP–O· + DMBC–OH → MPP–OH + DMBC–O·	1.4×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	87MUK/YOK
43	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 6-hydroxy-2,2,5,7-tetramethylchromane MPP–O· + TMC–OH → MPP–OH + TMC–O·	2.0×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	87MUK/YOK
44	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 6-hydroxy-2,2,5,8-tetramethylchromane MPP–O· + TMC–OH → MPP–OH + TMC–O·	2.2×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	87MUK/YOK
45	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 6-hydroxy-2,2,7,8-tetramethylchromane MPP–O· + TMC–OH → MPP–OH + TMC–O·	2.1×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	87MUK/YOK
46	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 6-hydroxy-2,2-dimethyl-5,7-diethylchromane MPP–O· + DMDEC–OH → MPP–OH + DMDEC–O·	1.9×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	87MUK/YOK
47	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 6-hydroxy-2,2-dimethyl-5,7-di-isopropylchromane MPP–O· + DMDIC–OH → MPP–OH + DMDIC–O·	2.8×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	87MUK/YOK
48	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 6-hydroxy-2,2,5-trimethyl-7-tert-butylchromane MPP–O· + TMBC–OH → MPP–OH + TMBC–O·	2.3×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	87MUK/YOK
49	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 6-hydroxy-2,2,5,7,8-pentamethylchromane MPP–O· + PMC–OH → MPP–OH + PMC–O·	4.2×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	87MUK/YOK
50	Phenoxyl + 6-hydroxy-2,2,5,7,8-pentamethylchroman $C_6H_5O\cdot$ + HPMC–OH → C_6H_5OH + HPMC–O·	3.7×10^{8}	t-Bu_2O_2 / MeCN (2/1)				f.p.	P.b.k. at 430 nm in deoxygenated soln. contg. 1.4 mol L^{-1} phenol.	94FOT/ING
51	Phenoxyl + Trolox C $C_6H_5O\cdot$ + TxOH → C_6H_5OH + TxO·	4.1×10^{8}	water (7)	RT			p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	88DAV/FOR
52	2-Methylphenoxyl + Trolox C 2-$CH_3C_6H_4O\cdot$ + TxOH → 2-$CH_3C_6H_4OH$ + TxO·	$<1\times10^{5}$	water (7)	RT			p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	88DAV/FOR
53	3-Methylphenoxyl + Trolox C 3-$CH_3C_6H_4O\cdot$ + TxOH → 3-$CH_3C_6H_4OH$ + TxO·	2.8×10^{8}	water (7)	RT			p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	88DAV/FOR
54	4-Methylphenoxyl + Trolox C 4-$CH_3C_6H_4O\cdot$ + TxOH → 4-$CH_3C_6H_4OH$ + TxO·	9.5×10^{7}	water (7)	RT			p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide; yield 53%.	88DAV/FOR
55	Tyrosyl radical + Trolox C TyrO· + TxOH → TyrOH + TxO·	3.1×10^{8}	water (7)	RT			p.r.	P.b.k. at 420 nm in N_2O-satd. soln. contg. 10 mmol L^{-1} phosphate, 1 mmol L^{-1} Tl_2SO_4, 0.4 mmol L^{-1} tyrosine, and 0.01–0.1 mmol L^{-1} Trolox.	89HUN/DES

TABLE 6. Reactions of phenoxyl radicals with phenols—Continued

No.	Phenoxyl + phenol Reaction	k ($L\ mol^{-1}\ s^{-1}$)	Solvent (pH)	T (K)	log A	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
		3.8×10^8	water (7.0)	RT			p.r.	P.b.k. at 440 nm in N_2O-satd. soln. contg. azide or bromide.	84BIS/AHM
		3.2×10^8	water (7)	RT			p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. azide.	88DAV/FOR
56	2-Carboxyphenoxyl + Trolox C 2-(CO_2^-)$C_6H_4O\cdot$ + TxOH → 2-(CO_2^-)C_6H_4OH + TxO·	3×10^8	water (7)	RT			p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	88DAV/FOR
57	2-Methoxy-4-(2′-methylvinyl)phenoxyl + Trolox C 2-(CH_3O)-4-($CH_3CH{=}CH$)$C_6H_3O\cdot$ + TxO^- → 2-(CH_3O)-4-($CH_3CH{=}CH$)$C_6H_3O^-$ + TxO·	5.4×10^7	water (10.5)	RT			p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. azide.	00GUH/PRI
58	2-Methoxy-4-(2′-acetylvinyl)phenoxyl + Trolox C 2-(CH_3O)-4-($CH_3COCH{=}CH$)$C_6H_3O\cdot$ + TxOH → 2-(CH_3O)-4-($CH_3COCH{=}CH$)C_6H_3OH + TxO·	8.3×10^7	water (6)	RT			p.r.	D.k. at 360 nm in N_2O-satd. soln. contg. azide.	99PRI/DEV
59	3,4-Dihydroxyphenylalanine semiquinone anion + Trolox C DOPA· + TxOH → DOPA + TxO·	7.4×10^4	water (7)	293			p.r.	P.b.k. at 425 nm in N_2O-satd. soln. contg. bromide.	94JOV/STE
60	Hesperidin semiquinone anion + Trolox C hesperidin-O· + TxOH → hesperidin-OH + TxO·	1.9×10^8	water (7)	293			p.r.	P.b.k. at 425 nm in N_2O-satd. soln. contg. bromide.	94JOV/STE
61	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + Vitamin K1-chromanol MPP–O· + K1-Chroman-OH → MPP–OH + K1-Chroman-O·	3.5×10^4	EtOH	298	7.02	14.3	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/OKAa
62	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + Vitamin K1-chromenol MPP–O· + K1-Chromen-OH → MPP–OH + K1-Chromen-O·	2.5×10^4	EtOH	298	7.37	17.0	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/OKAa
63	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + Ubichromanol MPP–O· + Ubichroman-OH → MPP–OH + Ubichroman-O·	4.2×10^2	EtOH	298	7.49	27.7	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/OKAa
64	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + Ubichromenol MPP–O· + Ubichromen-OH → MPP–OH + Ubichromen-O·	5.6×10^2	EtOH	298	6.89	23.9	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/OKAa
65	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + Tocol (6-hydroxy-2-methyl-2-phytylchroman) MPP–O· + Toc-OH → MPP–OH + Toc-O·	5.6×10^2	EtOH	298	7.39	27.1	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/KAG
66	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 5,7-dimethyltocol MPP–O· + DMToc-OH → MPP–OH + DMToc-O·	2.4×10^3	EtOH	298	6.48	17.5	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/KAG
67	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 5,7-diethyltocol MPP–O· + DEToc-OH → MPP–OH + DEToc-O·	2.0×10^3	EtOH	298	6.63	18.7	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/KAG
68	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 5,7-diisopropyltocol MPP–O· + DPToc-OH → MPP–OH + DPToc-O·	2.5×10^3	EtOH	298	6.71	18.5	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/KAG
69	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 5-methyl-7-tert-butyltocol MPP–O· + BMToc-OH → MPP–OH + BMToc-O·	3.0×10^3	EtOH	298	6.59	17.8	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/KAG
70	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 5-methyl-8-tert-butyltocol MPP–O· + BMToc-OH → MPP–OH + BMToc-O·	3.6×10^3	EtOH	298	6.38	16.1	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/KAG
71	2,6-Di-tert-butyl-4-(4′-methylphenyl)phenoxyl + Tocol MPP–O· + Toc-OH → MPP–OH + Toc-O·	6.7×10^2	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
72	2,6-Di-tert-butyl-4-phenylphenoxyl + Tocol PP–O· + Toc-OH → PP–OH + Toc-O·	1.1×10^3	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR

TABLE 6. Reactions of phenoxyl radicals with phenols—Continued

No.	Phenoxyl+phenol Reaction	k (L mol^{-1} s^{-1})	Solvent (pH)	T (K)	log A	E_a (kJ mol^{-1})	Method	Comments	Reference
73	2,6-Di-tert-butyl-4-(4′-bromophenyl)phenoxyl+Tocol								
	BPP–O· + Toc-OH → BPP–OH+ Toc-O·	1.3×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
74	2,6-Di-tert-butyl-4-(4′-nitrophenyl)phenoxyl+Tocol								
	NPP–O· + Toc-OH → NPP–OH+ Toc-O·	2.3×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
75	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+Tocol-d_1								
	MPP–O· + Toc-OD → MPP–OH+ Toc-O·	3.1×10^{1}	EtOD	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
76	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+Tocol								
	MPP–O· + Toc-OH → MPP–OH+ Toc-O·	5.6×10^{2}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	88MUK/FUK
77	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+5,7-dimethyltocol								
	MPP–O· + DMToc-OH → MPP–OH+ DMToc-O·	2.4×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	88MUK/FUK
78	Phenoxyl+ α-tocopherol								
	$C_6H_5O\cdot$ + α-Toc-OH → C_6H_5OH+ α-Toc-O·	1.1×10^{9}	t-Bu_2O_2 / benzene (3/1)	RT			f.p.	P.b.k. at 440 nm in deoxygenated soln. contg. 1.4 mol L^{-1} phenol.	94FOT/ING
		3.1×10^{8}	t-Bu_2O_2 / MeCN (2/1)	RT			f.p.	P.b.k. at 440 nm in deoxygenated soln. contg. 1.4 mol L^{-1} phenol.	94FOT/ING
79	Phenoxyl+ γ-tocopherol								
	$C_6H_5O\cdot$ + γ-Toc-OH → C_6H_5OH+ γ-Toc-O·	2.5×10^{8}	t-Bu_2O_2 / benzene (3/1)	RT			f.p.	P.b.k. at 430 nm in deoxygenated soln. contg. 1.4 mol L^{-1} phenol.	94FOT/ING
		8.9×10^{7}	t-Bu_2O_2 / MeCN (2/1)	RT			f.p.	P.b.k. at 430 nm in deoxygenated soln. contg. 1.4 mol L^{-1} phenol.	94FOT/ING
80	Phenoxyl+ δ-tocopherol								
	$C_6H_5O\cdot$ + δ-Toc-OH→ C_6H_5OH+ δ-Toc-O·	2×10^{7}	t-Bu_2O_2 / MeCN (2/1)	RT			f.p.	P.b.k. at 430 nm in deoxygenated soln. contg. 1.4 mol L^{-1} phenol.	94FOT/ING
81	Lysozyme tyrosyl radical+ α-tocopherol								
	Lys-TyrO· + α-Toc-OH → Lys-TyrOH+ α-Toc-O·	2.6×10^{4}	water/ micelles (7.0)	RT			p.r.	D.k. at 405 nm in N_2O-satd. soln. contg. azide and SDS micelles.	84HOE/BUT
82	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+ α-tocopherol								
	MPP–O· + α-Toc-OH → MPP–OH + α-Toc-O·	5.1×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	86MUK/WAT
		5.1×10^{3}	EtOH	298	7.00	18.7	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/ OKAa 89MUK/KAG
		1.5×10^{4}	benzene/ EtOH (2/1)	298			s.f.	D.k. at 375 and 580 nm in deaerated soln.	89MUK/NISa
83	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+ β-tocopherol								
	MPP–O· + β-Toc-OH → MPP–OH + β-Toc-O·	2.2×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	86MUK/WAT
		2.2×10^{3}	EtOH	298	7.10	21.1	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/KAG
84	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+ γ-tocopherol								
	MPP–O· + γ-Toc-OH → MPP–OH + γ-Toc-O·	2.4×10^{3}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	86MUK/WAT
		2.4×10^{3}	EtOH	298	7.31	22.2	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/KAG
85	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+ δ-tocopherol								
	MPP–O· + δ-Toc-OH → MPP–OH + δ-Toc-O·	5.1×10^{2}	EtOH	298			s.f.	D.k. at 376 and 580 nm in deaerated soln.	86MUK/WAT

TABLE 6. Reactions of phenoxyl radicals with phenols—Continued

No.	Phenoxyl+phenol Reaction	k (L mol^{-1} s^{-1})	Solvent (pH)	T (K)	log A	E_a (kJ mol^{-1})	Method	Comments	Reference
		1.0×10^{3}	EtOH	298	7.54	25.6	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/KAG
86	2,6-Di-tert-butyl-4-(4′-methylphenyl)phenoxyl+ α-tocopherol MPP–O· + α-Toc-OH → MPP–OH + α-Toc-O·	7.2×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
87	2,6-Di-tert-butyl-4-(4′-methylphenyl)phenoxyl+ β-tocopherol MPP–O· + β-Toc-OH → MPP–OH + β-Toc-O·	4.0×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
88	2,6-Di-tert-butyl-4-(4′-methylphenyl)phenoxyl+ γ-tocopherol MPP–O· + γ-Toc-OH → MPP–OH + γ-Toc-O·	3.6×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
89	2,6-Di-tert-butyl-4-(4′-methylphenyl)phenoxyl+ δ-tocopherol MPP–O· + δ-Toc-OH → MPP–OH + δ-Toc-O·	1.6×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
90	2,6-Di-tert-butyl-4-phenylphenoxyl+ α-tocopherol PP–O· + α-Toc-OH → PP–OH+ α-Toc-O·	8.8×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
91	2,6-Di-tert-butyl-4-phenylphenoxyl+ β-tocopherol PP–O· + β-Toc-OH → PP–OH+ β-Toc-O·	4.3×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
92	2,6-Di-tert-butyl-4-phenylphenoxyl+ γ-tocopherol PP–O· + γ-Toc-OH → PP–OH+ γ-Toc-O·	3.8×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
93	2,6-Di-tert-butyl-4-phenylphenoxyl+ δ-tocopherol PP–O· + δ-Toc-OH → PP–OH+ δ-Toc-O·	1.9×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
94	2,6-Di-tert-butyl-4-(4′-bromophenyl)phenoxyl+ α-tocopherol BPP–O· + α-Toc-OH → BPP–OH + α-Toc-O·	1.1×10^{4}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
95	2,6-Di-tert-butyl-4-(4′-bromophenyl)phenoxyl+ β-tocopherol BPP–O· + β-Toc-OH → BPP–OH + β-Toc-O·	6.1×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
96	2,6-Di-tert-butyl-4-(4′-bromophenyl)phenoxyl+ γ-tocopherol BPP–O· + γ-Toc-OH → BPP–OH + γ-Toc-O·	5.3×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
97	2,6-Di-tert-butyl-4-(4′-bromophenyl)phenoxyl+ δ-tocopherol BPP–O· + δ-Toc-OH → BPP–OH+ δ-Toc-O·	3.0×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
98	2,6-Di-tert-butyl-4-(4′-nitrophenyl)phenoxyl+ α-tocopherol NPP–O· + α-Toc-OH → NPP–OH + α-Toc-O·	2.2×10^{4}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
99	2,6-Di-tert-butyl-4-(4′-nitrophenyl)phenoxyl+ β-tocopherol NPP–O· + β-Toc-OH → NPP–OH + β-Toc-O·	1.3×10^{4}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
100	2,6-Di-tert-butyl-4-(4′-nitrophenyl)phenoxyl+ γ-tocopherol NPP–O· + γ-Toc-OH → NPP–OH + γ-Toc-O·	1.1×10^{4}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
101	2,6-Di-tert-butyl-4-(4′-nitrophenyl)phenoxyl+ δ-tocopherol NPP–O· + δ-Toc-OH → NPP–OH+ δ-Toc-O·	6.2×10^{3}	EtOH	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
102	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+ α-tocopherol-d_1 MPP–O· + α-Toc-OD → MPP–OD + α-Toc-O·	2.2×10^{2}	EtOD	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
103	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+ β-tocopherol-d_1 MPP–O· + β-Toc-OD → MPP–OD + β-Toc-O·	1.5×10^{2}	EtOD	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
104	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+ γ-tocopherol-d_1 MPP–O· + γ-Toc-OD → MPP–OD + γ-Toc-O·	1.6×10^{2}	EtOD	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
105	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+ δ-tocopherol-d_1 MPP–O· + δ-Toc-OD → MPP–OD + δ-Toc-O·	6.4×10^{1}	EtOD	298			s.f.	D.k. at 370–380 nm in deaerated soln.	92NAG/KUR
106	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+ α-tocopherol								

TABLE 6. Reactions of phenoxyl radicals with phenols—Continued

No.	Phenoxyl + phenol Reaction	k ($L\ mol^{-1}\ s^{-1}$)	Solvent (pH)	T (K)	log A	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
	MPP–O· + α-Toc-OH → MPP–OH + α-Toc-O·	5.1×10^3	EtOH	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		1.4×10^4	diethyl ether	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		9.5×10^4	benzene	298			s.f.	D.k. at 375 and/or 580 nm in deaerted soln.	93MUK/MOR
		1.9×10^5	n-hexane	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
107	Phenoxyl + 2,3-dihydro-5-hydroxy-2,4,6,7-tetramethyl-2-phytylbenzofuran								
	C_6H_5O· + HTMPB-OH → C_6H_5OH + HTMPB-O·	2.4×10^8	t-Bu_2O_2 /MeCN(2/1)				f.p.	P.b.k. at 430 nm in deoxygenated soln. contg. 1.4 mol L^{-1} phenol.	94FOT/ING
108	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 2,3-dihydro-5-hydroxy-2,2-dimethylbenzofuran								
	MPP–O· + DMBF–OH → MPP–OH + DMBF–O·	8.8×10^2	EtOH	298	8.00	28.8	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/OKAa
109	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 7-tert-Butyl-2,3-dihydro-5-hydroxy-2,2,4-trimethylbenzofuran								
	MPP–O· + BTMBF–OH → MPP–OH + BTMBF–O·	9.1×10^3	EtOH	298	7.02	17.5	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/OKAa
110	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 2,3-dihydro-5-hydroxy-2,2,4,6-tetramethylbenzofuran								
	MPP–O· + TMBF–OH → MPP–OH + TMBF–O·	3.5×10^3	EtOH	298	6.57	17.3	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/OKAa
111	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 2,3-dihydro-5-hydroxy-2,2-dimethyl-4,6-diisopropylbenzofuran								
	MPP–O· + DMDIBF–OH → MPP–OH + DMDIBF–O·	5.4×10^3	EtOH	298	6.74	17.2	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/OKAa
112	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 2,3-dihydro-5-hydroxy-2,2,4,6,7-pentamethylbenzofuran								
	MPP–O· + PMBF–OH → MPP–OH + PMBF–O·	7.0×10^3	EtOH	298	6.60	15.8	s.f.	D.k. at 376 and 580 nm in deaerated soln.	89MUK/OKAa
113	4-methoxyphenoxyl + catechol								
	4-$CH_3OC_6H_4O$· + 2-$(O^-)C_6H_4O^-$ → 4-$CH_3OC_6H_4O^-$ + 2-$(O^-)C_6H_4O$·	8.6×10^8	water (13.5)	RT			p.r.	D.k. at 420 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET
114	1,3-Benzosemiquinone anion + catechol								
	3-$(O^-)C_6H_4O$· + 2-$(O^-)C_6H_4O^-$ → 3-$(O^-)C_6H_4O^-$ + 2-$(O^-)C_6H_4O$·	7.5×10^8	water (13.5)	RT			p.r.	D.k. at 450 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET
115	Phenoxyl + resorcinol								
	C_6H_5O· + 3-$(O^-)C_6H_4O^-$ → $C_6H_5O^-$ + 3-$(O^-)C_6H_4O$·	1.7×10^9	water (13.5)	RT			p.r.	P.b.k. at 450 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET
116	4-Carboxyphenoxyl + resorcinol								
	4-$(CO_2^-)C_6H_4O$· + 3-$(O^-)C_6H_4O^-$ → 4-$(CO_2^-)C_6H_4O^-$ + 3-$(O^-)C_6H_4O$·	1.1×10^9	water (13.5)	RT			p.r.	P.b.k. at 450 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET
117	Phenoxyl + hydroquinone								
	C_6H_5O· + 4-$HOC_6H_4O^-$ → $C_6H_5O^-$ + 4-$(O^-)C_6H_4O$·	2.2×10^9	water (11.6)	RT			p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET
118	Acetaminophenoxyl + hydroquinone								
	4-$CH_3CONHC_6H_4O$· + 4-$(O^-)C_6H_4O^-$ → 4-$CH_3CONHC_6H_4O^-$ + 4-$(O^-)C_6H_4O$·	1.4×10^8	water (12.6)	RT			p.r.	Kinetics in N_2O-satd. soln.	88BIS/TAB
119	Galvinoxyl + hydroquinone								
	Galvinoxyl· + 4-HOC_6H_4OH → Galvinoxyl-H + 4-HOC_6H_4O·	1.6×10^3	CCl_4	293		17.6	chem.	D.k. at 435 nm.	78NIS/OKA
		1.8×10^3		298					
		2.1×10^3		303					
		9.2×10^2	CCl_4	298			chem.	D.k. at 435 nm in soln. satd. with H_2O.	78NIS/OKA
		1.9×10^3	benzene	298			chem.	D.k. at 435 nm in soln. satd. with H_2O.	78NIS/OKA

TABLE 6. Reactions of phenoxyl radicals with phenols—Continued

No.	Phenoxyl + phenol Reaction	k ($L\ mol^{-1}\ s^{-1}$)	Solvent (pH)	T (K)	$\log A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
	Galvinoxyl· + 4-DOC_6H_4OD → Galvinoxyl-D + 4-DOC_6H_4O·	3.2×10^2	CCl_4	298			chem.	D.k. at 435 nm in soln. satd. with D_2O.	78NIS/OKA
		4.8×10^2	benzene	298			chem.	D.k. at 435 nm in soln. satd. with D_2O.	78NIS/OKA
120	4-Methoxyphenoxyl + 3,4-dihydroxybenzoate ion								
	4-$CH_3OC_6H_4O$· + 3,4-$(O^-)_2C_6H_3CO_2^-$ → 4-$CH_3OC_6H_4O^-$ + 3,4-$(O^-)(O·)C_6H_3CO_2^-$	7×10^8	water (13.5)	RT			p.r.	D.k. at 420 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET
121	4-(N,N-Dimethylamino)phenoxyl + 3,4-dihydroxyphenylacetate ion								
	4-$(CH_3)_2NC_6H_4O$· + 3,4-$(O^-)_2C_6H_3CH_2CO_2^-$ → 4-$(CH_3)_2NC_6H_4O^-$ + 3,4-$(O^-)(O·)C_6H_3CH_2CO_2^-$	9×10^7	water (13.5)	RT			p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	82STE/NET
122	4-(N,N-Dimethylamino)phenoxyl + 3,4-dihydroxyphenylalanine								
	4-$(CH_3)_2NC_6H_4O$· + 3,4-$(O^-)_2C_6H_3CH_2CH(NH_2)CO2-$ → 4-$(CH_3)_2NC_6H_4O^-$ + 3,4-$(O^-)(O·)C_6H_3CH_2CH(NH_2)CO_2^-$	7×10^7	water (13.5)	RT			p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	82STE/NET
123	α-Tocopheroxyl + isoprenaline (3,4-dihydroxy-α-[(isopropylamino)methyl]benzyl alcohol)								
	α-Toc-O· + isoprenaline-OH → α-Toc-OH + isoprenalin-O·	3.2×10^3	n-BuOH				chem.	Decay of ESR signal of α-tocopheroxyl radical, produced by reaction of α-tocopherol with DPPH, in the presence of various concentrations of isoprenaline. Decay includes α-Toc-O· + α-Toc-O· and α-Toc-O· + isoprenaline.	93OND/MIS
124	α-Tocopheroxyl + epinephrin								
	α-Toc-O· + epinephrin-OH → α-Toc-OH + epinephrin-O·	1.5×10^3	n-BuOH				chem.	Decay of ESR signal of α-tocopheroxyl radical, produced by reaction of α-tocopherol with DPPH, in the presence of various concentrations of epinephrin. Decay includes α-Toc-O· + α-Toc-O· and α-Toc-O· + epinephrin.	93OND/MIS
125	3,6-Di-tert-butyl-1,2-benzosemiquinone + 3,6-di-tert-butylcatechol								
	3,6-$(t\text{-}Bu)_2$-2-HOC_6H_2O· + 3,6-$(t\text{-}Bu)_2$-2-HOC_6H_2OH → 3,6-$(t\text{-}Bu)_2$-2-HOC_6H_2OH + 3,6-$(t\text{-}Bu)_2$-2-HOC_6H_2O·	7×10^8	CCl_4	298	10.9	11.7	chem.	ESR line broadening in soln. contg. 3,6-di-tert-butyl-o-quinone and 3,6-di-tert-butylcatechol.	74ZAV/PRO
126	1,3-Benzosemiquinone anion + 2,5-dihydroxyacetophenone								
	3-$(O^-)C_6H_4O$· + 2,5-$(O^-)_2C_6H_3COCH_3$ → 3-$(O^-)C_6H_4O^-$ + 2,5-$(O^-)(O·)C_6H_3COCH_3$	$\approx1\times10^9$	water (13.5)	RT			p.r.	P.b.k. at 520 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET
127	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + trimethylhydroquinone								
	MPP–O· + $(CH_3)_3C_6H(OH)OH$ → MPP–OH + $(CH_3)_3C_6H(OH)O$·	8.6×10^3	EtOH	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		2.2×10^4	diethyl ether	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		2.3×10^5	benzene	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR

TABLE 6. Reactions of phenoxyl radicals with phenols—Continued

No.	Phenoxyl + phenol Reaction	k ($L\ mol^{-1}\ s^{-1}$)	Solvent (pH)	T (K)	$\log A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
128	Phenoxyl + 2,3-dimethoxy-5-methylhydroquinone (ubiquinol-0)								
	$C_6H_5O\cdot + UQH_2 \rightarrow C_6H_5OH + UQH\cdot$	9.1×10^7	t-Bu_2O_2/ benzene (3/1)				f.p.	P.b.k. at 430 nm in deoxygenated soln. contg. 1.4 mol L^{-1} phenol.	94FOT/ING
129	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + Ubiquinol-0								
	MPP–O· + UQH_2 → MPP–OH + UQH·	2.9×10^3	EtOH	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		2.7×10^3	diethyl ether	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		1.3×10^4	benzene	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		2.0×10^4	n-hexane	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
130	Phenoxyl + 2,3-dimethoxy-5-methyl-6-[$(CH_2CH \rightarrow C(CH_3)CH_2)_{10}$H]-hydroquinone (ubiquinol-10)								
	$C_6H_5O\cdot + UQH_2 \rightarrow C_6H_5OH + UQH\cdot$	8.4×10^7	t-Bu_2O_2/ benzene (3/1)				f.p.	P.b.k. at 430 nm in deoxygenated soln. contg. 1.4 mol L^{-1} phenol.	94FOT/ING
131	α-Tocopheroxyl + Ubiquinol-10								
	α-Toc-O· + UQH_2 → α-Toc-OH + UQH·	3.7×10^5	benzene	298			s.f.	D.k. at 425 nm.	90MUK/KIK
		2.2×10^5	EtOH	298			s.f.	D.k. at 425 nm.	90MUK/KIK
132	5,7-Dimethyltocoxyl radical + Ubiquinol-10								
	DMToc-O· + UQH_2 → DMToc-OH + UQH·	4.4×10^5	benzene	298			s.f.	D.k. at 425 nm.	90MUK/KIK
		2.7×10^5	EtOH	298			s.f.	D.k. at 425 nm.	90MUK/KIK
133	5,7-Diethyltocoxyl radical + Ubiquinol-10								
	DEToc-O· + UQH_2 → DEToc-OH + UQH·	2.9×10^5	benzene	298			s.f.	D.k. at 425 nm.	90MUK/KIK
		1.4×10^5	EtOH	298			s.f.	D.k. at 425 nm.	90MUK/KIK
134	5,7-Diisopropyltocoxyl radical + Ubiquinol-10								
	DPToc-O· + UQH_2 → DPToc-OH + UQH·	8.5×10^4	benzene	298			s.f.	D.k. at 425 nm.	90MUK/KIK
		3.6×10^4	EtOH	298			s.f.	D.k. at 425 nm.	90MUK/KIK
135	5-Methyl-7-tert-butyltocoxyl radical + Ubiquinol-10								
	BMToc-O· + UQH_2 → BMToc-OH + UQH·	7.7×10^4	benzene	298			s.f.	D.k. at 425 nm.	90MUK/KIK
		3.5×10^4	EtOH	298			s.f.	D.k. at 425 nm.	90MUK/KIK
136	5-Isopropyl-7-tert-butyltocoxyl radical + Ubiquinol-10								
	BPToc-O· + UQH_2 → BPToc-OH + UQH·	7.1×10^3	benzene	298			s.f.	D.k. at 425 nm.	90MUK/KIK
		3.7×10^3	EtOH	298			s.f.	D.k. at 425 nm.	90MUK/KIK
137	5,7-Diethyl-8-methyltocoxyl + Ubiquinol-10								
	DEToc-O· + UQH_2 → DEToc-OH + UQH·	1.6×10^5	benzene	298			s.f.	D.k. at 425 nm.	90MUK/KIK
		8.2×10^4	EtOH	298			s.f.	D.k. at 425 nm.	90MUK/KIK
138	5,7-Diisopropyl-8-methyltocoxyl + Ubiquinol-10								
	DPToc-O· + UQH_2 → DPToc-OH + UQH·	1.6×10^4	benzene	298			s.f.	D.k. at 425 nm.	90MUK/KIK
		8.6×10^3	EtOH	298			s.f.	D.k. at 425 nm.	90MUK/KIK
139	2,6-Di-tert-butyl-4-(4′-methoxyphenyl) phenoxyl + Ubiquinol-10								
	MPP–O· + UQH_2 → MPP–OH + UQH·	5.2×10^3	EtOH	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		3.9×10^3	diethyl ether	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		1.1×10^4	benzene	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		2.1×10^4	n-hexane	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
140	1,2-Benzosemiquinone anion + 1,2,4-trihydroxybenzene								
	2-$(O^-)C_6H_4O\cdot$ + 1,2,4-$C_6H_3(O^-)_3$ → 2-$(O^-)C_6H_4O^-$ + 1,2,4-$C_6H_3(O^-)_2(O\cdot)$	9.0×10^6	water (13.5)	RT			p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET

TABLE 6. Reactions of phenoxyl radicals with phenols—Continued

No.	Phenoxyl + phenol Reaction	k ($L\ mol^{-1}\ s^{-1}$)	Solvent (pH)	T (K)	$\log A$	E_a ($kJ\ mol^{-1}$)	Method	Comments	Reference
141	3-Hydroxy-1,2-benzosemiquinone anion + 1,2,4-trihydroxybenzene								
	$1,2,3\text{-}(O^-)_2C_6H_3O\cdot + 1,2,4\text{-}(O^-)_2C_6H_3O^- \rightarrow 1,2,3\text{-}(O^-)_2C_6H_3O^- + 1,2,4\text{-}(O^-)_2C_6H_3O\cdot$	$\approx 1\times10^5$	water (13.5)	RT			p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET
142	4-(N,N-Dimethylamino)phenoxyl + 6-hydroxydopamine								
	$4\text{-}(CH_3)_2NC_6H_4O\cdot + (O^-)_3C_6H_2CH_2CH_2NH_2 \rightarrow 4\text{-}(CH_3)_2NC_6H_4O^- + (O^-)_2(O\cdot)C_6H_2CH_2CH_2NH_2$	$\approx 5\times10^8$	water (13.5)	RT			p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	82STE/NET
143	Lysozyme tyrosyl radical + n-propyl gallate								
	$Lys\text{-}TyrO\cdot + 3,4,5\text{-}(HO)_3C_6H_2CO_2C_3H_7 \rightarrow Lys\text{-}TyrOH + 3,4,5\text{-}(OH)(O^-)(O\cdot)C_6H_2CO_2C_3H_7$	9.9×10^6	water/ micelles (7.0)	RT			p.r.	D.k. at 405 nm in N_2O-satd. soln. contg. azide and SDS micelles.	84HOE/BUT
144	Trolox phenoxyl radical + propyl gallate								
	$TxO\cdot + 3,4,5\text{-}(HO)_3C_6H_2CO_2C_3H_7 \rightarrow TxOH + 3,4,5\text{-}(OH)(O^-)(O\cdot)C_6H_2CO_2C_3H_7$	$<1\times10^5$	water (7)	RT			p.r.	D.k. at 430 nm in N_2O-satd. soln. contg. azide.	88DAV/FOR
145	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 2-methyl-1,4-dihydroxynaphthalene (Vitamin K_3 reduced)								
	$MPP\text{–}O\cdot + MeNp(OH)OH \rightarrow MPP\text{–}OH + MeNp(OH)O\cdot$	1.1×10^5	EtOH	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		1.5×10^4	diethyl ether	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		1.8×10^6	benzene	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		$>1\times10^7$	n-hexane	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
146	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 2-methyl-3-phytyl-1,4-dihydroxynaphthalene (Vitamin K_1 reduced)								
	$MPP\text{–}O\cdot + VitK_1H_2 \rightarrow MPP\text{–}OH + VitK_1H\cdot$	1.6×10^5	EtOH	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		2.3×10^5	diethyl ether	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		1.5×10^6	benzene	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		$>1\times10^7$	n-hexane	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
147	4-(N,N-Dimethylamino)phenoxyl + esculetin (6,7-dihydroxycoumarin)								
	$4\text{-}(CH_3)_2NC_6H_4O\cdot + esculetin \rightarrow 4\text{-}(CH_3)_2NC_6H_4O^- + esculetin\cdot$	1.4×10^8	water (13.5)	RT			p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	82STE/NET
148	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + α-Tocopherol quinone, reduced								
	$MPP\text{–}O\cdot + \alpha TQH_2 \rightarrow MPP\text{–}OH + \alpha TQH\cdot$	1.4×10^4	EtOH	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		2.9×10^4	diethyl ether	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		1.3×10^5	benzene	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		1.5×10^5	n-hexane	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
149	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + β-Tocopherol quinone, reduced								
	$MPP\text{–}O\cdot + \beta TQH_2 \rightarrow MPP\text{–}OH + \beta TQH\cdot$	8.4×10^3	EtOH	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		1.5×10^4	diethyl ether	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		1.3×10^5	benzene	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
150	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + γ-Tocopherol quinone, reduced								
	$MPP\text{–}O\cdot + \gamma TQH_2 \rightarrow MPP\text{–}OH + \gamma TQH\cdot$	1.5×10^4	EtOH	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		3.7×10^4	diethyl ether	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
		2.2×10^5	benzene	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR

TABLE 6. Reactions of phenoxyl radicals with phenols—Continued

No.	Phenoxyl + phenol Reaction	k (L mol^{-1} s^{-1})	Solvent (pH)	T (K)	log A	E_a (kJ mol^{-1})	Method	Comments	Reference
		7.6×10^5	n-hexane	298			s.f.	D.k. at 375 and/or 580 nm in deaerated soln.	93MUK/MOR
151	Epicatechin semiquinone anion + epicatechin epicatechin(1,3-(O^-)($O\cdot$)) + epicatechin → epicatechin + epicatechin(1,2-(O^-)($O\cdot$))	1.1×10^7	water (7, 10)	293			p.r.	D.k. at 450 nm in N_2O-satd. soln. contg. azide. Conversion of a *m*- to *o*-semiquinone. Intramolecular electron transfer to give the same result is also proposed.	95JOV/HAR
152	Epigallocatechin semiquinone anion + epigallocatechin epigallocatechin(1,3-(O^-)($O\cdot$)) + epigallocatechin → epigallocatechin + epigallocatechin(1,2-(O^-)($O\cdot$))	2.2×10^7 3.8×10^7 1.6×10^8	water (3) water (7) water (10)	293			p.r.	D.k. at 450 nm in N_2O-satd. soln. contg. azide. Conversion of a *m*- to *o*-semiquinone. Intramolecular electron transfer to give the same result is also proposed.	95JOV/HAR
153	Epigallocatechin gallate semiquinone anion + epigallocatechin gallate epigallocatechin gallate(1,3-(O^-)($O\cdot$)) + epigallocatechin gallate → epigallocatechin gallate + epigallocatechin gallate(1,2-(O^-)($O\cdot$))	1.3×10^8 3.5×10^8	water (3) water (7)	293			p.r.	D.k. at 450 nm in N_2O-satd. soln. contg. azide. Conversion of a *m*- to *o*-semiquinone. Intramolecular electron transfer to give the same result is also proposed.	95JOV/HAR
154	Galvinoxyl + catechin Gal-O$\cdot$ + Catechin-OH → Gal-OH + Catechin-O$\cdot$	2.3×10^2	MeCN				chem.	D.k. at 428 nm in deaerated soln. k is accelerated with increasing [Mg^{2+}].	02NAK/MIY
155	Galvinoxyl + trihydrogalvinoxyl G$\cdot$ + GH_3 → GH + $GH_2\cdot$	$\approx2.5\times10^2$	cyclohexane	298			chem.	Kinetics of ESR signal. Derived from fitting to a complex mechanism. For reverse reaction $k_r \approx 2.5\times10^4$.	71ADA/CHI
156	Tyrosyl + urate ion TyrO$\cdot$ + urate$^-$ → TyrO$^-$ + urate$\cdot$	2.4×10^8	water (7)	293			p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. phosphate and Tl^+.	89HUN/DES
157	Lysozyme tyrosyl radical + urate ion Lys-TyrO$\cdot$ + Urate ion → Lys-TyrOH + Urate radical anion	5.4×10^6	water/ micelles (7.0)	RT			p.r.	D.k. at 405 nm in N_2O-satd. soln. contg. azide and SDS micelles.	84HOE/BUT
158	Trolox phenoxyl radical + urate ion TxO$\cdot$ + urate ion → TxOH + urate radical	$<1\times10^5$	water (7)	RT			p.r.	D.k. at 430 nm in N_2O-satd. soln. contg. azide.	88DAV/FOR
159	Tetra(tert-butyl)indophenoxyl + tetrachloro-o-benzoquinone (o-chloranil) TBIP-O$\cdot$ + o-$C_6Cl_4O_2$ → products	5.4×10^{-3}	THF	293	8.06	59.8	chem.	Decay of ESR signal of TBIP-O$\cdot$. Radical produced by oxidation of TBIP-OH with PbO_2.	79KHI/KOS
160	Tetra(tert-butyl)indophenoxyl + tetrachloro-p-benzoquinone (p-chloranil) TBIP-O$\cdot$ + p-$C_6Cl_4O_2$ → products	6.5×10^{-3}	THF	293	4.0	36.4	chem.	Decay of ESR signal of TBIP-O$\cdot$. Radical produced by oxidation of TBIP-OH with PbO_2.	79KHI/KOS

TABLE 7. Reactions of phenoxyl radicals with ascorbic acid and derivatives

No.	Phenoxyl + reactant Reaction	k (L mol^{-1} s^{-1})	pH	Solvent	T (K)	Method	Comments	Reference
1	Phenoxyl + ascorbate ion $C_6H_5O\cdot + AscH^- \rightarrow C_6H_5O^- + Asc\cdot^- + H^+$	6.9×10^8	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
2	2-Fluorophenoxyl + ascorbate ion $2\text{-}FC_6H_4O\cdot + AscH^- \rightarrow 2\text{-}FC_6H_4O^- + Asc\cdot^- + H^+$	9.5×10^8	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
3	3-Fluorophenoxyl + ascorbate ion $3\text{-}FC_6H_4O\cdot + AscH^- \rightarrow 3\text{-}FC_6H_4O^- + Asc\cdot^- + H^+$	9.7×10^8	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
4	4-Fluorophenoxyl + ascorbate ion $4\text{-}FC_6H_4O\cdot + AscH^- \rightarrow 4\text{-}FC_6H_4O^- + Asc\cdot^- + H^+$	4.6×10^8	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
5	2-Chlorophenoxyl + ascorbate ion $2\text{-}ClC_6H_4O\cdot + AscH^- \rightarrow 2\text{-}ClC_6H_4O^- + Asc\cdot^- + H^+$	1.1×10^9	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
6	3-Chlorophenoxyl + ascorbate ion $3\text{-}ClC_6H_4O\cdot + AscH^- \rightarrow 3\text{-}ClC_6H_4O^- + Asc\cdot^- + H^+$	1.3×10^9	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
7	4-Chlorophenoxyl + ascorbate ion $4\text{-}ClC_6H_4O\cdot + AscH^- \rightarrow 4\text{-}ClC_6H_4O^- + Asc\cdot^- + H^+$	7.3×10^8	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
8	2-Bromophenoxyl + ascorbate ion $2\text{-}BrC_6H_4O\cdot + AscH^- \rightarrow 2\text{-}BrC_6H_4O^- + Asc\cdot^- + H^+$	7.7×10^8	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
9	3-Bromophenoxyl + ascorbate ion $3\text{-}BrC_6H_4O\cdot + AscH^- \rightarrow 3\text{-}BrC_6H_4O^- + Asc\cdot^- + H^+$	8.9×10^8	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
10	4-Bromophenoxyl + ascorbate ion $4\text{-}BrC_6H_4O\cdot + AscH^- \rightarrow 4\text{-}BrC_6H_4O^- + Asc\cdot^- + H^+$	8.3×10^8	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
11	4-Iodophenoxyl + ascorbate ion $4\text{-}IC_6H_4O\cdot + AscH^- \rightarrow 4\text{-}IC_6H_4O^- + Asc\cdot^- + H^+$	1.1×10^9	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
12	2-Cyanophenoxyl + ascorbate ion $2\text{-}NCC_6H_4O\cdot + AscH^- \rightarrow 2\text{-}NCC_6H_4O^- + Asc\cdot^- + H^+$	1.8×10^9	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
13	4-Cyanophenoxyl + ascorbate ion $4\text{-}NCC_6H_4O\cdot + AscH^- \rightarrow 4\text{-}NCC_6H_4O^- + Asc\cdot^- + H^+$	2.0×10^9	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
14	2-Carboxyphenoxyl + ascorbate ion $2\text{-}(CO_2^-)C_6H_4O\cdot + AscH^- \rightarrow 2\text{-}(CO_2^-)C_6H_4O^- + Asc\cdot^- + H^+$	8.3×10^7	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
15	4-Carboxyphenoxyl + ascorbate ion $4\text{-}(CO_2^-)C_6H_4O\cdot + AscH^- \rightarrow 4\text{-}(CO_2^-)C_6H_4O^- + Asc\cdot^- + H^+$	4.6×10^8	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
16	3-Hydroxyphenoxyl + ascorbate ion $3\text{-}HOC_6H_4O\cdot + AscH^- \rightarrow 3\text{-}HOC_6H_4O^- + Asc\cdot^- + H^+$	1.1×10^8	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH

TABLE 7. Reactions of phenoxyl radicals with ascorbic acid and derivatives—Continued

No.	Phenoxyl + reactant Reaction	k ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	Method	Comments	Reference
17	4-Aminophenoxyl + ascorbate ion $4\text{-}H_2NC_6H_4O\cdot + AscH^- \rightarrow 4\text{-}H_2NC_6H_4O^- + Asc\cdot^- + H^+$	5.1×10^7	11	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 400 nm in N_2O-satd. soln.	77SCH
18	4-Methoxyphenoxyl + ascorbate ion $4\text{-}CH_3OC_6H_4O\cdot + AscH^- \rightarrow 4\text{-}CH_3OC_6H_4OH + Asc\cdot^-$	5.2×10^7	8	water	RT	p.r.	D.k. at 420 nm.	95KHA/ALF
19	Tyrosyl + ascorbate ion $TyrO\cdot + AscH^- \rightarrow TyrOH + Asc\cdot^-$	4.4×10^8	7	water	RT	p.r.	P.b.k. at 360 nm in N_2O-satd. soln. contg. 1 mmol L^{-1} Tl_2SO_4, 0.4 mmol L^{-1} tyrosine, and 0.01–0.1 mmol L^{-1} ascorbate.	89HUN/DES
20	Lysozyme tyrosyl radical + ascorbate ion $Lys\text{-}TyrO\cdot + AscH^- \rightarrow Lys\text{-}TyrOH + Asc\cdot^- + H^+$	1.1×10^7	7.0	water/micelles	RT	p.r.	D.k. at 405 nm in N_2O-satd. soln. contg. azide and SDS micelles.	84HOE/BUT
21	3,5-Dichlorophenoxyl + ascorbate ion $3,5\text{-}Cl_2C_6H_3O\cdot + AscH^- \rightarrow 3,5\text{-}Cl_2C_6H_3O^- + Asc\cdot^- + H^+$	1.6×10^9	11	water	RT	p.r.	P.b.k. at 360 nm in N_2O-satd. soln. $I = 0.01$.	95KHA/NET
22	3,5-Diiodotyrosyl + ascorbate ion $3,5\text{-}I_2\text{-}TyrO\cdot + AscH^-(Asc^{2-}) \rightarrow 3,5\text{-}I_2\text{-}TyrO^- + Asc\cdot^- + H^+$	2.1×10^9 8.5×10^8	7.4 12	water	RT	p.r.	D.k. at 420 nm in N_2O-satd. soln. contg. azide. Similar k in the absence of azide.	96DAS
23	2,4,5-Trichlorophenoxyl + ascorbate ion $2,4,5\text{-}Cl_3C_6H_2O\cdot + AscH^- \rightarrow 2,4,5\text{-}Cl_3C_6H_2O^- + Asc\cdot^- + H^+$	1.1×10^9	11	water	RT	p.r.	P.b.k. at 360 nm in N_2O-satd. soln. $I = 0.01$.	95KHA/NET
24	Pentafluorophenoxyl + ascorbate ion $C_6F_5O\cdot + AscH^- \rightarrow C_6F_5O^- + Asc\cdot^- + H^+$	1.3×10^9	11	water	RT	p.r.	P.b.k. at 360 nm in N_2O-satd. soln. $I = 0.01$.	95KHA/NET
25	Pentachlorophenoxyl + ascorbate ion $C_6Cl_5O\cdot + AscH^- \rightarrow C_6Cl_5O^- + Asc\cdot^- + H^+$	1.4×10^9	11	water	RT	p.r.	P.b.k. at 360 nm in N_2O-satd. soln. $I = 0.01$.	95KHA/NET
26	Trolox phenoxyl radical + ascorbate ion $TxO\cdot + AscH^- \rightarrow TxOH + Asc\cdot^-$	1.1×10^7	8.3	water	RT	p.r.	D.k. at 440 nm in N_2O-satd. soln. contg. azide. Derived from fitting to a complex mechanism. $k_r = 1.0\times10^4$.	95BOR/MIC
		8.3×10^6	7.2	water	RT	p.r.	P.b.k. at 360 nm and d.k. at 430 nm in N_2O-satd. soln. contg. bromide.	88DAV/FOR
27	7-tert-Butyl-5-isopropyltocoxyl + ascorbate ion $Toc\text{-}O\cdot + AscH^- \rightarrow Toc\text{-}OH + Asc\cdot^-$	3.2×10^2		water/micelles	298	s.f.	D.k. at 416 nm in deoxygenated soln. contg. 10% Triton X-100 and 0.1 mol L^{-1} phosphate buffer. k measured as a function of pH between 3 and 10. Ascorbic acid is unreactive.	91MUK/NIS

TABLE 7. Reactions of phenoxyl radicals with ascorbic acid and derivatives—Continued

No.	Phenoxyl+reactant Reaction	k (L mol^{-1} s^{-1})	pH	Solvent	T (K)	Method	Comments	Reference
28	α-Tocopheroxyl+ascorbate ion							
	α-Toc-O$\cdot$ + AscH$^-$ → α-Toc-OH+ Asc$\cdot^-$	9.0×10^5	7.2	water/micelles	293	s.f.	Kinetic ESR in deoxygenated soln. contg. phosphate buffer and 0.015 mol L^{-1} CTAB . Radical produced by reaction of tocopherol with Fremy's salt in a triple mixing apparatus. k is for overall reaction in the aqueous and the micellar phases.	92LIU/HAN
		7.2×10^7	6.8	water/micelles	RT	f.p.	D.k. at 430 nm in air satd. soln. contg. CTAC micelles.	91BIS/PAR
		3.8×10^4	7.2	water/micelles	RT	f.p.	D.k. at 430 nm in air satd. soln. contg. SDS micelles.	91BIS/PAR
29	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl+ascorbic acid							
	MPP–O$\cdot$ + AscH$_2$ → MPP–OH+ AscH$\cdot$	6.1×10^1		benzene/ EtOH (2/1)	298	s.f.	D.k. at 375 and 580 nm in deaerated soln.	89MUK/ NISa
30	2,2,5,7,8-Pentamethylchroman-6-oxyl+ascorbic acid							
	PMC–O$\cdot$ + AscH$_2$ → PMC–OH+ AscH$\cdot$	9.5×10^4		EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/ NOG
31	5-Iso-propyl-7-tert-butyltocoxyl+ascorbic acid							
	Toc-O$\cdot$ + AscH$_2$ → Toc-OH+ AscH$\cdot$	7.6×10^1		benzene/ EtOH/water (2/1/0.1)	298	s.f.	D.k. at 420 nm in deoxygenated soln.	89MUK/ NISb
32	5,7-Di-iso-propyltocoxyl+ascorbic acid							
	Toc-O$\cdot$ + AscH$_2$ → Toc-OH+ AscH$\cdot$	2.3×10^2		benzene/ EtOH/water (2/1/0.1)	298	s.f.	D.k. at 420 nm in deoxygenated soln.	89MUK/ NISb
33	5-Methyl-7-tert-butyltocoxyl+ascorbic acid							
	Toc-O$\cdot$ + AscH$_2$ → Toc-OH+ AscH$\cdot$	3.3×10^2		benzene/ EtOH/water (2/1/0.1)	298	s.f.	D.k. at 420 nm in deoxygenated soln.	89MUK/ NISb
34	5,7-Diethyltocoxyl+ascorbic acid							
	Toc-O$\cdot$ + AscH$_2$ → Toc-OH+ AscH$\cdot$	1.7×10^4		benzene/ EtOH/water (2/1/0.1)	298	s.f.	D.k. at 420 nm in deoxygenated soln.	89MUK/ NISb
35	5,7-Di-iso-propyltocoxyl+ascorbic acid							
	Toc-O$\cdot$ + AscH$_2$ → Toc-OH+ AscH$\cdot$	5.5×10^2		benzene/ EtOH (2/1)	298	s.f.	D.k. at 421 nm in deoxygenated soln.	89MUK/ NISa
36	7-tert-Butyl-5-isopropyltocoxyl+ascorbic acid							
	Toc-O$\cdot$ + AscH$_2$ → Toc-OH+ AscH$\cdot$	4.9×10^1		benzene/ EtOH (2/1)	298	s.f.	D.k. at 416 nm in deoxygenated soln.	91MUK/NIS
37	α-Tocopheroxyl+ascorbic acid							
	Toc-O$\cdot$ + AscH$_2$ → Toc-OH+ AscH$\cdot$	1.1×10^5		EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/ NOG
38	2,3-Dihydro-2,2,4,6-tetramethylbenzofuran-5-oxyl+ascorbic acid							
	BOM–O$\cdot$ + AscH$_2$ → BOM–OH+ AscH$\cdot$	8.3×10^4		EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/ NOG
39	2,3-Dihydro-2,2-dimethyl-4,6-di-tert-butylbenzofuran-5-oxyl+ascorbic acid							
	BOB-O$\cdot$ + AscH$_2$ → BOB–OH+ AscH$\cdot$	2.9×10^1		EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/ NOG
40	2,3-Dihydro-2,2-dipentyl-4,6-di-tert-butylbenzofuran-5-oxyl+ascorbic acid							

TABLE 7. Reactions of phenoxyl radicals with ascorbic acid and derivatives—Continued

No.	Phenoxyl + reactant Reaction	k ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	Method	Comments	Reference
	BO–653-O· + $AscH_2$ → BO–653-OH + AscH·	3.3×10^{1}		EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
41	α-Tocopheroxyl + 6-O-capryloylascorbic acid α-Toc-O· + capryloyl-$AscH_2$ → α-Toc-OH + capryloyl-Asc·$^-$	3.0×10^{5}	7.2	water/micelles	293	s.f.	Kinetic ESR in deoxygenated soln. contg. phosphate buffer and 0.015 mol L^{-1} CTAB. Radical produced by reaction of tocopherol with Fremy's salt in a triple mixing apparatus. k is for overall reaction in the aqueous and the micellar phases.	92LIU/HAN
42	α-Tocopheroxyl + 6-O-lauroylascorbic acid α-Toc-O· + lauroyl-$AscH_2$ → α-Toc-OH + lauroyl-Asc·$^-$	7.0×10^{4}	7.2	water/micelles	293	s.f.	Kinetic ESR in deoxygenated soln. contg. phosphate buffer and 0.015 mol L^{-1} CTAB. Radical produced by reaction of tocopherol with Fremy's salt in a triple mixing apparatus. k is for overall reaction in the aqueous and the micellar phases.	92LIU/HAN
43	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 2-O-Octadecylascorbic acid MPP–O· + Octadecyl-$AscH_2$ → MPP–OH + Octadecyl-AscH·	3.6×10^{1}		benzene/EtOH (2/1)	298	s.f.	D.k. at 375 and 580 nm in deaerated soln.	89MUK/NISa
44	5,7-Di-iso-propyltocoxyl + 2-O-Octadecylascorbic acid Toc-O· + Octadecyl-$AscH_2$ → Toc-OH + Octadecyl-AscH·	2.2×10^{2}		benzene/EtOH (2/1)	298	s.f.	D.k. at 421 nm in deoxygenated soln.	89MUK/NISa
45	2,6-Di-tert-butyl-6-methylphenoxyl + 6-O-palmitoylascorbic acid 2,6-$(t\text{-}Bu)_2$-6-MeC_6H_2O· + Palmitoyl-$AscH_2$ → 2,6-$(t\text{-}Bu)_2$-6-MeC_6H_2OH + palmitoyl-AscH·	2.5×10^{3}		benzene	300	therm.	Steady-state ESR in deoxygenated soln. contg. the phenol, ascorbyl palmitate, and di-tert- butyl hyponitrite.	93ROG/STE
46	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 6-O-Palmitoylascorbic acid MPP-O· + Palmitoyl-$AscH_2$ → MPP-OH + Palmitoyl-AscH·	7.5×10^{1}		benzene/EtOH (2/1)	298	s.f.	D.k. at 375 and 580 nm in deaerated soln.	89MUK/NISa
47	5,7-Di-iso-propyltocoxyl + 6-O-Palmitoylascorbic acid Toc-O· + Palmitoyl-$AscH_2$ → Toc-OH + Palmitoyl-AscH·	6.9×10^{2}		benzene/EtOH (2/1)	298	s.f.	D.k. at 421 nm in deoxygenated soln.	89MUK/NISa
48	α-Tocopheroxyl + 6-*O*-palmitoylascorbic acid α-Toc-O· + Palmitoyl-$AscH_2$ → α-Toc-OH + palmitoyl-AscH·	3.0×10^{3}	7.2	water/micelles	293	s.f.	Kinetic ESR in deoxygenated soln. contg. phosphate buffer and 0.015 mol L^{-1} CTAB. Radical produced by reaction of tocopherol with Fremy's salt in a triple mixing apparatus. k is for overall reaction in the aqueous and the micellar phases.	92LIU/HAN

TABLE 7. Reactions of phenoxyl radicals with ascorbic acid and derivatives—Continued

No.	Phenoxyl + reactant Reaction	k ($L\ mol^{-1}\ s^{-1}$)	pH	Solvent	T (K)	Method	Comments	Reference
		2.8×10^{3}		benzene	300	therm.	Steady-state ESR in deoxygenated soln. contg. the tocopherol, ascorbyl palmitate, and di-tert-butyl hyponitrite.	93ROG/STE
49	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 6-O-Stearoylascorbic acid							
	MPP-O· + Stearoyl-$AscH_2$ → MPP-OH + Stearoyl-AscH·	7.1×10^{1}		benzene/ EtOH (2/1)	298	s.f.	D.k. at 375 and 580 nm in deaerated soln.	89MUK/ NISa
50	5,7-Diethyltocoxyl + 6-O-Stearoylascorbic acid							
	Toc-O· + Stearoyl-$AscH_2$ → Toc-OH + Stearoyl-AscH·	4.2×10^{4}		benzene/ EtOH/water (2/1/0.1)	298	s.f.	D.k. at 420 nm in deoxygenated soln.	89MUK/ NISb
51	5-Methyl-7-tert-butyltocoxyl + 6-O-Stearoylascorbic acid							
	Toc-O· + Stearoyl-$AscH_2$ → Toc-OH + Stearoyl-AscH·	6.9×10^{2}		benzene/ EtOH/water (2/1/0.1)	298	s.f.	D.k. at 420 nm in deoxygenated soln.	89MUK/ NISb
52	5,7-Diisopropyltocoxyl + 6-O-Stearoylascorbic acid							
	Toc-O· + Stearoyl-$AscH_2$ → Toc-OH + Stearoyl-AscH·	3.5×10^{2}		benzene/ EtOH/water (2/1/0.1)	298	s.f.	D.k. at 420 nm in deoxygenated soln.	89MUK/ NISb
		6.3×10^{2}		benzene/ EtOH (2/1)	298	s.f.	D.k. at 421 nm in deoxygenated soln.	89MUK/ NISa
53	5-Iso-propyl-7-tert-butyltocoxyl + 6-O-Stearoylascorbic acid							
	Toc-O· + Stearoyl-$AscH_2$ → Toc-OH + Stearoyl-AscH·	2.2×10^{1}		benzene/ EtOH/water (2/1/0.1)	298	s.f.	D.k. at 420 nm in deoxygenated soln.	89MUK/ NISb
54	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 5,6-O-Didocosanoylascorbic acid							
	MPP–O· + Didocosanoyl-$AscH_2$ → MPP–OH + Didocosanoyl-AscH·	5.8×10^{1}		benzene/ EtOH (2/1)	298	s.f.	D.k. at 375 and 580 nm in deaerated soln.	89MUK/ NISa
55	5,7-Diisopropyltocoxyl + 5,6-O-Didocosanoylascorbic acid							
	Toc-O· + Didocosanoyl-$AscH_2$ → Toc-OH + Didocosanoyl-AscH·	3.9×10^{2}		benzene/ EtOH (2/1)	298	s.f.	D.k. at 421 nm in deoxygenated soln.	89MUK/ NISa
56	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 5,6-O-Dimyristoylascorbic acid							
	MPP–O· + Dimyristoyl-$AscH_2$ → MPP–OH + Dimyristoyl-AscH·	5.0×10^{1}		benzene/ EtOH (2/1)	298	s.f.	D.k. at 375 and 580 nm in deaerated soln.	89MUK/ NISa
57	5,7-Diisopropyltocoxyl + 5,6-O-Dimyristoylascorbic acid							
	Toc-O· + Dimyristoyl-$AscH_2$ → Toc-OH + Dimyristoyl-AscH·	4.4×10^{2}		benzene/ EtOH (2/1)	298	s.f.	D.k. at 421 nm in deoxygenated soln.	89MUK/ NISa
58	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 2,6-O-Dipalmitoylascorbic acid							
	MPP–O· + Dipalmitoyl-$AscH_2$ → MPP–OH + Dipalmitoyl-AscH·	2.4		benzene/ EtOH (2/1)	298	s.f.	D.k. at 375 and 580 nm in deaerated soln.	89MUK/ NISa
59	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 5,6-O-Dipalmitoylascorbic acid							
	MPP–O· + Dipalmitoyl-$AscH_2$ → MPP–OH + Dipalmitoyl-AscH·	4.4×10^{1}		benzene/ EtOH (2/1)	298	s.f.	D.k. at 375 and 580 nm in deaerated soln.	89MUK/ NISa
60	5,7-Diisopropyltocoxyl + 2,6-O-Dipalmitoylascorbic acid							
	Toc-O· + Dipalmitoyl-$AscH_2$ → Toc-OH + Dipalmitoyl-AscH·	4.8		benzene/ EtOH (2/1)	298	s.f.	D.k. at 421 nm in deoxygenated soln.	89MUK/ NISa
61	5,7-Diisopropyltocoxyl + 5,6-O-Dipalmitoylascorbic acid							
	Toc-O· + Dipalmitoyl-$AscH_2$ → Toc-OH + Dipalmitoyl-AscH·	3.1×10^{2}		benzene/ EtOH (2/1)	298	s.f.	D.k. at 421 nm in deoxygenated soln.	89MUK/ NISa
62	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 5,6-O-Dipropanoylascorbic acid							
	MPP-O· + Dipropanoyl-$AscH_2$ → MPP-OH + Dipropanoyl-AscH·	5.0×10^{1}		benzene/ EtOH (2/1)	298	s.f.	D.k. at 375 and 580 nm in deaerated soln.	89MUK/ NISa
63	5,7-Diisopropyltocoxyl + 5,6-O-Dipropanoylascorbic acid							
	Toc-O· + Dipropanoyl-$AscH_2$ → Toc-OH + Dipropanoyl-AscH·	3.9×10^{2}		benzene/ EtOH (2/1)	298	s.f.	D.k. at 421 nm in deoxygenated soln.	89MUK/ NISa
64	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + 5,6-O-Distearoylascorbic acid							
	MPP-O· + Distearoyl-$AscH_2$ → MPP–OH + Distearoyl-AscH·	5.5×10^{1}		benzene/ EtOH (2/1)	298	s.f.	D.k. at 375 and 580 nm in deaerated soln.	89MUK/ NISa
65	5,7-Diisopropyltocoxyl + 5,6-O-Distearoylascorbic acid							
	Toc-O· + Distearoyl-$AscH_2$ → Toc-OH + Distearoyl-AscH·	3.3×10^{2}		benzene/ EtOH (2/1)	298	s.f.	D.k. at 421 nm in deoxygenated soln.	89MUK/ NISa

TABLE 8. Reactions of phenoxyl radicals with hydroperoxides and peroxides

No.	Phenoxyl + reactant Reaction	k (L mol^{-1} s^{-1})	Solvent	T (K)	Method	Comments	Reference
1	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + n-propyl hydroperoxide 2,6-(t-Bu)$_2$-4-(MeOPh)C$_6$H$_2$O· + n-PrOOH → 2,6-(t-Bu)$_2$-4-(MeOPh)C$_6$H$_2$OH + n-PrOO·	3.2×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
2	5,7-Diethyltocoxyl + n-propyl hydroperoxide 5,7-Et$_2$-Toc-O· + n-PrOOH → 5,7-Et$_2$-Toc-OH + n-PrOO·	2.7×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
3	5,7-Di-iso-propyltocoxyl + n-propyl hydroperoxide 5,7-(i-Pr)$_2$-Toc-O· + n-PrOOH → 5,7-(i-Pr)$_2$-Toc-OH + n-PrOO·	1.3×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
		4.6×10^{-2}	benzene/EtOH	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
4	5,7-Di-iso-propyltocoxyl + n-propyl hydroperoxide-O-d 5,7-(i-Pr)$_2$-Toc-O· + n-PrOOD → 5,7-(i-Pr)$_2$-Toc-OD + n-PrOO·	1.3×10^{-2}	benzene/EtOD	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
5	5-Methyl-7-tert-butyltocoxyl + n-propyl hydroperoxide 5-Me-7-t-Bu-Toc-O· + n-PrOOH → 5-Me-7-t-Bu-Toc-OH + n-PrOO·	9.3×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
6	5-iso-Propyl-7-tert-butyltocoxyl + n-propyl hydroperoxide 5-i-Pr-7-t-Bu-Toc-O· + n-PrOOH → 5-i-Pr-7-t-Bu-Toc-OH + n-PrOO·	8.0×10^{-3}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
7	5,7-Diethyl-8-methyltocoxyl + n-propyl hydroperoxide 5,7-Et$_2$-8-Me-Toc-O· + n-PrOOH → 5,7-Et$_2$-8-Me-Toc-OH + n-PrOO·	2.0×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
8	5,7-Di-iso-propyl-8-methyltocoxyl + n-propyl hydroperoxide 5,7-(i-Pr)$_2$-8-Me-Toc-O· + n-PrOOH → 5,7-(i-Pr)$_2$-8-Me-Toc-OH + n-PrOO·	2.5×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
9	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + iso-propyl hydroperoxide 2,6-(t-Bu)$_2$-4-(MeOPh)C$_6$H$_2$O· + i-PrOOH → 2,6-(t-Bu)$_2$-4-(MeOPh)C$_6$H$_2$OH + i-PrOO·	5.2×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
10	5,7-Diethyltocoxyl + iso-propyl hydroperoxide 5,7-Et$_2$-Toc-O· + i-PrOOH → 5,7-Et$_2$-Toc-OH + i-PrOO·	6.8×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
11	5,7-Di-iso-propyltocoxyl + iso-propyl hydroperoxide 5,7-(i-Pr)$_2$-Toc-O· + i-PrOOH → 5,7-(i-Pr)$_2$-Toc-OH + i-PrOO·	2.1×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
		6.3×10^{-2}	benzene/EtOH	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
12	5,7-Di-iso-propyltocoxyl + iso-propyl hydroperoxide-O-d 5,7-(i-Pr)$_2$-Toc-O· + i-PrOOD → 5,7-(i-Pr)$_2$-Toc-OD + i-PrOO·	1.6×10^{-2}	benzene/EtOD	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
13	5-Methyl-7-tert-butyltocoxyl + iso-propyl hydroperoxide 5-Me-7-t-Bu-Toc-O· + i-PrOOH → 5-Me-7-t-Bu-Toc-OH + i-PrOO·	1.8×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
14	5-iso-Propyl-7-tert-butyltocoxyl + iso-propyl hydroperoxide 5-i-Pr-7-t-Bu-Toc-O· + i-PrOOH → 5-i-Pr-7-t-Bu-Toc-OH + i-PrOO·	1.2×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW

TABLE 8. Reactions of phenoxyl radicals with hydroperoxides and peroxides—Continued

No.	Phenoxyl + reactant Reaction	k (L mol^{-1} s^{-1})	Solvent	T (K)	Method	Comments	Reference
15	5,7-Diethyl-8-methyltocoxyl + iso-propyl hydroperoxide						
	5,7-Et_2-8-Me-Toc-O· + i-PrOOH → 5,7-Et_2-8-Me-Toc-OH + i-PrOO·	3.7×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
16	5,7-Di-iso-propyl-8-methyltocoxyl + iso-propyl hydroperoxide						
	5,7-(i-Pr)$_2$-8-Me-Toc-O· + i-PrOOH → 5,7-(i-Pr)$_2$-8-Me-Toc-OH + i-PrOO·	4.7×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
17	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + n-butyl hydroperoxide						
	2,6-(t-Bu)$_2$-4-(MeOPh)C_6H_2O· + n-BuOOH → 2,6-(t-Bu)$_2$-4-(MeOPh)C_6H_2OH + n-BuOO·	3.5×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
18	5,7-Diethyltocoxyl + n-butyl hydroperoxide						
	5,7-Et_2-Toc-O· + n-BuOOH → 5,7-Et_2-Toc-OH + n-BuOO·	3.9×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
19	5,7-Di-iso-propyltocoxyl + n-butyl hydroperoxide						
	5,7-(i-Pr)$_2$-Toc-O· + n-BuOOH → 5,7-(i-Pr)$_2$-Toc-OH + n-BuOO·	1.3×10^{-1}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	88MUK/KOH
		1.3×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
		6.4×10^{-2}	benzene/EtOH	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
20	5,7-Di-iso-propyltocoxyl + n-butyl hydroperoxide-O-d						
	5,7-(i-Pr)$_2$-Toc-O· + n-BuOOD → 5,7-(i-Pr)$_2$-Toc-OD + n-BuOO·	1.9×10^{-2}	benzene/EtOD	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
21	5-Methyl-7-tert-butyltocoxyl + n-butyl hydroperoxide						
	5-Me-7-t-Bu-Toc-O· + n-BuOOH → 5-Me-7-t-Bu-Toc-OH + n-BuOO·	1.2×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
22	5-iso-Propyl-7-tert-butyltocoxyl + n-butyl hydroperoxide						
	5-i-Pr-7-t-Bu-Toc-O· + n-BuOOH → 5-i-Pr-7-t-Bu-Toc-OH + n-BuOO·	7.8×10^{-3}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
23	5,7-Diethyl-8-methyltocoxyl + n-butyl hydroperoxide						
	5,7-Et_2-8-Me-Toc-O· + n-BuOOH → 5,7-Et_2-8-Me-Toc-OH + n-BuOO·	2.2×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
24	5,7-Di-iso-propyl-8-methyltocoxyl + n-butyl hydroperoxide						
	5,7-(i-Pr)$_2$-8-Me-Toc-O· + n-BuOOH → 5,7-(i-Pr)$_2$-8-Me-Toc-OH + n-BuOO·	2.9×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
25	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + sec-butyl hydroperoxide						
	2,6-(t-Bu)$_2$-4-(MeOPh)C_6H_2O· + sec-BuOOH → 2,6-(t-Bu)$_2$-4-(MeOPh)C_6H_2OH + sec-BuOO·	6.6×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
26	5,7-Diethyltocoxyl + sec-butyl hydroperoxide						
	5,7-Et_2-Toc-O· + sec-BuOOH → 5,7-Et_2-Toc-OH + sec-BuOO·	6.4×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
27	5,7-Di-iso-propyltocoxyl + sec-butyl hydroperoxide						
	5,7-(i-Pr)$_2$-Toc-O· + sec-BuOOH → 5,7-(i-Pr)$_2$-Toc-OH + sec-BuOO·	2.4×10^{-1}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	88MUK/KOH
		2.4×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW

TABLE 8. Reactions of phenoxyl radicals with hydroperoxides and peroxides—Continued

No.	Phenoxyl + reactant Reaction	k ($L\ mol^{-1}\ s^{-1}$)	Solvent	T (K)	Method	Comments	Reference
		1.0×10^{-1}	benzene/EtOH	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
28	5,7-Di-iso-propyltocoxyl + sec-butyl hydroperoxide-O-d 5,7-$(i\text{-}Pr)_2$-Toc-O· + sec-BuOOD → 5,7-$(i\text{-}Pr)_2$-Toc-OD + sec-BuOO·	2.4×10^{-2}	benzene/EtOD	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
29	5-Methyl-7-tert-butyltocoxyl + sec-butyl hydroperoxide 5-Me-7-t-Bu-Toc-O· + sec-BuOOH → 5-Me-7-t-Bu-Toc-OH + sec-BuOO·	2.1×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
30	5-iso-Propyl-7-tert-butyltocoxyl + sec-butyl hydroperoxide 5-i-Pr-7-t-Bu-Toc-O· + sec-BuOOH → 5-i-Pr-7-t-Bu-Toc-OH + sec-BuOO·	1.3×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
	OH + sec-BuOO·						
31	5,7-Diethyl-8-methyltocoxyl + sec-butyl hydroperoxide 5,7-Et_2-8-Me-Toc-O· + sec-BuOOH → 5,7-Et_2-8-Me-Toc-OH + sec-BuOO·	3.5×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
32	5,7-Di-iso-propyl-8-methyltocoxyl + sec-butyl hydroperoxide 5,7-$(i\text{-}Pr)_2$-8-Me-Toc-O· + sec-BuOOH → 5,7-$(i\text{-}Pr)_2$-8-Me-Toc-OH + sec-BuOO·	5.0×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
33	2,6-Di-tert-butyl-4-(4′-methoxyphenyl)phenoxyl + tert-butyl hydroperoxide 2,6-$(t\text{-}Bu)_2$-4-(MeOPh)C_6H_2O· + t-BuOOH → 2,6-$(t\text{-}Bu)_2$- 4-(MeOPh)C_6H_2OH + t-BuOO·	9.3×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
34	2,2,5,7,8-Pentamethylchroman-6-oxyl + tert-butyl hydroperoxide PMC-O· + t-BuOOH → PMC-OH + t-BuOO·	3.7×10^{-1}	EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
35	5,7-Diethyltocoxyl + tert-butyl hydroperoxide 5,7-Et_2-Toc-O· + t-BuOOH → 5,7-Et_2-Toc-OH + t-BuOO·	1.1	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
36	5,7-Diisopropyltocoxyl + tert-butyl hydroperoxide 5,7-$(i\text{-}Pr)_2$-Toc-O· + t-BuOOH → 5,7-$(i\text{-}Pr)_2$-Toc-OH + t-BuOO·	3.7×10^{-1}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	88MUK/KOH
		3.7×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
		1.7×10^{-1}	benzene/EtOH	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
37	5,7-Di-iso-propyltocoxyl + tert-butyl hydroperoxide-O-d 5,7-$(i\text{-}Pr)_2$-Toc-O· + t-BuOOD → 5,7-$(i\text{-}Pr)_2$-Toc-OD + t-BuOO·	3.5×10^{-2}	benzene/EtOD	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
38	5-Methyl-7-tert-butyltocoxyl + tert-butyl hydroperoxide 5-Me-7-t-Bu-Toc-O· + t-BuOOH → 5-Me-7-t-Bu-Toc-OH + t-BuOO·	3.5×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
39	5-iso-Propyl-7-tert-butyltocoxyl + tert-butyl hydroperoxide 5-i-Pr-7-t-Bu-Toc-O· + t-BuOOH → 5-i-Pr-7-t-Bu-Toc-OH + t-BuOO·	1.9×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
40	5,7-Diethyl-8-methyltocoxyl + tert-butyl hydroperoxide 5,7-Et_2-8-Me-Toc-O· + t-BuOOH → 5,7-Et_2-8-Me-Toc-OH + t-BuOO·	6.5×10^{-1}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW

TABLE 8. Reactions of phenoxyl radicals with hydroperoxides and peroxides—Continued

No.	Phenoxyl + reactant Reaction	k (L mol^{-1} s^{-1})	Solvent	T (K)	Method	Comments	Reference
41	5,7-Di-iso-propyl-8-methyltocoxyl + tert-butyl hydroperoxide						
	5,7-(i-Pr)$_2$-8-Me-Toc-O· + t-BuOOH → 5,7-(i-Pr)$_2$-8-Me-Toc-OH + t-BuOO·	7.0×10^{-2}	benzene	298	s.f.	D.k. at 400–450 nm in deoxygenated soln.	92NAG/SAW
42	α-Tocopheroxyl + tert-butyl hydroperoxide						
	α-Toc-O· + t-BuOOH → α-Toc-OH + t-BuOO·	4.1×10^{-1}	EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
43	2,3-Dihydro-2,2,4,6-tetramethylbenzofuran-5-oxyl + tert-butyl hydroperoxide						
	BOM-O· + t-BuOOH → BOM-OH + t-BuOO·	2.6×10^{-1}	EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
44	2,3-Dihydro-2,2-dimethyl-4,6-di-tert-butylbenzofuran-5-oxyl + tert-butyl hydroperoxide						
	BOB-O· + t-BuOOH → BOB-OH + t-BuOO·	1.1×10^{-1}	EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
45	2,3-Dihydro-2,2-dipentyl-4,6-di-tert-butylbenzofuran-5-oxyl + tert-butyl hydroperoxide						
	BO-653-O· + t-BuOOH → BO-653-OH + t-BuOO·	1.4×10^{-1}	EtOH	310	chem.	D.k. of ESR signal in deaerated soln. contg. galvinoxyl.	00WAT/NOG
46	2,4,6-Tri-tert-butylphenoxyl + cumene hydroperoxide						
	2,4,6-(t-Bu)$_3$C$_6$H$_2$O· + PhCMe$_2$OOH → 2,4,6-(t-Bu)$_3$C$_6$H$_2$OH + PhCMe$_2$OO·	3.7×10^{-1}	cumene	313	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	70MAH/ DARb
		1.8×10^{-1}	benzene	303	chem.	Decay of ESR signal in deoxygenated soln. The phenoxyl radical produced by oxidation with PbO_2. $\log A=7.1$, $E_a=45.6$ kJ mol^{-1}. Data for reverse reaction, derived from fitting to complex mechanism: $k_r=4\times10^3$, $\log A=6.5$, $E_a=16.7$ kJ mol^{-1}.	73GRI/DEN
		2.5×10^{-1}	CCl_4	298	chem.	D.k. at 400 nm in deoxygenated soln. The phenoxyl radical produced by oxidation with PbO_2.	89VAR/DEN
47	2,4,6-Tri-tert-butylphenoxyl + tetralin hydroperoxide						
	2,4,6-(t-Bu)$_3$C$_6$H$_2$O· + TOOH → 2,4,6-(t-Bu)$_3$C$_6$H$_2$OH + TOO·	6.9×10^{-1} 2.0	PhCl	297 333	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67MAH/DAR
		3.4×10^{-1} 5.5×10^{-1} 1.0	PhCl	303 318 333	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	70MAH/ DARb
		4.3×10^{-1} 6.6×10^{-1} 9.7×10^{-1}	PhCl/tetralin	303 318 333	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	70MAH/ DARb
48	2,4,6-Tri-tert-butylphenoxyl + 9,10-dihydroanthracene hydroperoxide						
	2,4,6-(t-Bu)$_3$C$_6$H$_2$O· + DHAOOH → 2,4,6-(t-Bu)$_3$C$_6$H$_2$OH + DHAOO·	2.0×10^{-1}	benzene	297	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67MAH/DAR
		1.8×10^{-1} 8.7×10^{-1}	PhCl	297 333	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	67MAH/DAR

TABLE 8. Reactions of phenoxyl radicals with hydroperoxides and peroxides—Continued

No.	Phenoxyl + reactant Reaction	k (L mol^{-1} s^{-1})	Solvent	T (K)	Method	Comments	Reference
		1.5×10^{-1}	PhCl	303	s.f.	D.k. at 400 or 630 nm in deoxygenated soln.	70MAH/DARb
49	5,7-Diisopropyl-2,2-dimethylchroman-6-oxyl + methyl linoleate hydroperoxide DIDMCO· + MLOOH → DIDMCOH + MLOO·	1.3×10^{-1}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr., $k=1.1\times10^{-1}$ in 5% Triton X-100 micellar soln.	93MUK/SAW
50	5,7-Diethyltocoxyl + methyl linoleate hydroperoxide 5,7-Et_2-Toc-O· + MLOOH → 5,7-Et_2-Toc-OH + MLOO·	2.5×10^{-1}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	93MUK/SAW
51	5,7-Di-iso-propyltocoxyl + methyl linoleate hydroperoxide 5,7-$(i\text{-}Pr)_2$-Toc-O· + MLOOH → 5,7-$(i\text{-}Pr)_2$-Toc-OH + MLOO·	1.3×10^{-1}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr., $k=6.9\times10^{-2}$ in 5% Triton X-100 micellar soln.	93MUK/SAW
		2.5×10^{-3}	t-BuOH	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr., $k=6.9\times10^{-2}$ in 5% Triton X-100 micellar soln.	93MUK/SAW
52	5-Methyl-7-tert-butyltocoxyl + methyl linoleate hydroperoxide 5-Me-7-t-Bu-Toc-O· + MLOOH → 5-Me-7-t-Bu-Toc-OH + MLOO·	9.1×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	93MUK/SAW
53	5-Isopropyl-7-tert-butyltocoxyl + methyl linoleate hydroperoxide 5-i-Pr-7-t-Bu-Toc-O· + MLOOH → 5-i-Pr-7-t-Bu-Toc-OH + MLOO·	7.8×10^{-3}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	93MUK/SAW
54	5,7-Diethyl-8-methyltocoxyl + methyl linoleate hydroperoxide 5-Et_2-8-Me-Toc-O· + MLOOH → 5-Et_2-8-Me-Toc-OH + MLOO·	1.3×10^{-1}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	93MUK/SAW
55	5,7-Di-iso-propyl-8-methyltocoxyl + methyl linoleate hydroperoxide 5-$(i\text{-}Pr)_2$-8-Me-Toc-O· + MLOOH → 5-$(i\text{-}Pr)_2$-8-Me-Toc-OH + MLOO·	2.1×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	93MUK/SAW
56	α-Tocopheroxyl + methyl linoleate hydroperoxide α-Toc-O· + MLOOH → α-Toc-OH + MLOO·	5.0×10^{-1}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	93MUK/SAW
57	2,3-Dihydro-2,2-dimethyl-4,6-diisopropylbenzofuran-5-oxyl + methyl linoleate hydroperoxide BF-O· + MLOOH → BF-OH + MLOO·	8.4×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr.	93MUK/SAW
58	5,7-Di-iso-propyltocoxyl + phosphatidylcholine hydroperoxide Toc-O· + PCOOH → Toc-OH + PCOO·	1.1×10^{-2}	benzene	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr., $k=2.0\times10^{-2}$ in 5% Triton X-100 micellar soln.	93MUK/SAW
		4.7×10^{-3}	t-BuOH	298	chem.	D.k. at 417 nm in deaerated soln., H-abstr., $k=2.0\times10^{-2}$ in 5% Triton X-100 micellar soln.	93MUK/SAW
59	2,4,6-Tri-tert-butylphenoxyl + di-tert-butylperoxide 2,4,6-$(t\text{-}Bu)_3$-C_6H_2O· + (t-Bu)OO(t-Bu) → products	8.7×10^{-4}	t-Bu_2O_2/pentane	283	chem.	D.k. of ESR signal. $\log A=4.6$, $E_a=41.4$ kJ mol^{-1}.	67PRO/SOL

TABLE 8. Reactions of phenoxyl radicals with hydroperoxides and peroxides—Continued

No.	Phenoxyl + reactant Reaction	k (L mol^{-1} s^{-1})	Solvent	T (K)	Method	Comments	Reference
60	4-Phenyl-2,6-di-tert-butylphenoxyl + di-tert-butylperoxide 4-Ph-2,6-(t-Bu)$_2$-C$_6$H$_2$O· + (t-Bu)OO(t-Bu) → products	3.6×10^{-4}	t-Bu$_2$O$_2$ /pentane	283	chem.	D.k. of ESR signal. log A=5.0, E_a = 46.0 kJ mol^{-1}.	67PRO/SOL
61	4-(4-Methylphenyl)-2,6-di-tert-butylphenoxyl + di-tert-butylperoxide 4-(4-MePh)-2,6-(t-Bu)$_2$-C$_6$H$_2$O· + (t-Bu)OO(t-Bu) → products	2.4×10^{-4}	t-Bu$_2$O$_2$/pentane	283	chem.	D.k. of ESR signal. log A=5.0, E_a = 46.9 kJ mol^{-1}.	67PRO/SOL
62	4-(4-Ethylphenyl)-2,6-di-tert-butylphenoxyl + di-tert-butylperoxide 4-(4-EtPh)-2,6-(t-Bu)$_2$-C$_6$H$_2$O· + (t-Bu)OO(t-Bu) → products	2.3×10^{-4}	t-Bu$_2$O$_2$/pentane	283	chem.	D.k. of ESR signal. log A=5.0, E_a = 46.9 kJ mol^{-1}.	67PRO/SOL
63	4-(4-Isopropylphenyl)-2,6-di-tert-butylphenoxyl + di-tert-butylperoxide 4-(4-i-PrPh)-2,6-(t-Bu)$_2$-C$_6$H$_2$O· + (t-Bu)OO(t-Bu) → products	2.4×10^{-4}	t-Bu$_2$O$_2$/pentane	283	chem.	D.k. of ESR signal. log A=5.0, E_a = 46.9 kJ mol^{-1}.	67PRO/SOL
64	4-(4-tert-Butylphenyl)-2,6-di-tert-butylphenoxyl + di-tert-butylperoxide 4-(4-t-BuPh)-2,6-(t-Bu)$_2$-C$_6$H$_2$O· + (t-Bu)OO(t-Bu) → products	2.5×10^{-4}	t-Bu$_2$O$_2$/pentane	283	chem.	D.k. of ESR signal. log A=5.0, E_a = 46.9 kJ mol^{-1}.	67PRO/SOL
65	4-(2-Methoxyphenyl)-2,6-di-tert-butylphenoxyl + di-tert-butylperoxide 4-(2-MeOPh)-2,6-(t-Bu)$_2$-C$_6$H$_2$O· + (t-Bu)OO(t-Bu) → products	2.8×10^{-4}	t-Bu$_2$O$_2$/pentane	283	chem.	D.k. of ESR signal. log A=5.25, E_a = 47.7 kJ mol^{-1}.	67PRO/SOL
66	4-(4-Methoxyphenyl)-2,6-di-tert-butylphenoxyl + di-tert-butylperoxide 4-(4-MeOPh)-2,6-(t-Bu)$_2$-C$_6$H$_2$O· + (t-Bu)OO(t-Bu) → products	1.5×10^{-4}	t-Bu$_2$O$_2$/pentane	283	chem.	D.k. of ESR signal. log A=5.4, E_a = 49.8 kJ mol^{-1}.	67PRO/SOL
67	4-(4-Acetylphenyl)-2,6-di-tert-butylphenoxyl + di-tert-butylperoxide 4-(4-CH$_3$COPh)-2,6-(t-Bu)$_2$-C$_6$H$_2$O· + (t-Bu)OO(t-Bu) → products	8.7×10^{-4}	t-Bu$_2$O$_2$ /pentane	283	chem.	D.k. of ESR signal. log A=4.8, E_a = 42.7 kJ mol^{-1}.	67PRO/SOL
68	4-(4-Chlorophenyl)-2,6-di-tert-butylphenoxyl + di-tert-butylperoxide 4-(4-ClPh)-2,6-(t-Bu)$_2$-C$_6$H$_2$O· + (t-Bu)OO(t-Bu) → products	6.2×10^{-4}	t-Bu$_2$O$_2$/pentane	283	chem.	D.k. of ESR signal. log A=4.9, E_a = 43.9 kJ mol^{-1}.	67PRO/SOL
69	4-(4-Phenoxyphenyl)-2,6-di-tert-butylphenoxyl + di-tert-butylperoxide 4-(4-PhOPh)-2,6-(t-Bu)$_2$-C$_6$H$_2$O· + (t-Bu)OO(t-Bu) → products	2.5×10^{-4}	t-Bu$_2$O$_2$/pentane	283	chem.	D.k. of ESR signal. log A=5.0, E_a = 46.9 kJ mol^{-1}.	67PRO/SOL
70	4-(2-Naphthyl)-2,6-di-tert-butylphenoxyl + di-tert-butylperoxide 4-(2-Naphthyl)-2,6-(t-Bu)$_2$-C$_6$H$_2$O· + (t-Bu)OO(t-Bu) → products	9.1×10^{-4}	t-Bu$_2$O$_2$/pentane	283	chem.	D.k. of ESR signal. log A=5.0, E_a = 43.5 kJ mol^{-1}.	67PRO/SOL
71	Tetra(tert-butyl)indophenoxyl + di-tert-butylperoxide TBIP-O· + (t-Bu)OO(t-Bu) → products	1.3×10^{-4}	t-Bu$_2$O$_2$/pentane	313	chem.	D.k. of ESR signal in deaerated soln. log A=6.5, E_a = 62.3 kJ mol^{-1}.	68PRO/SOL
72	Galvinoxyl + di-tert-butylperoxide Galv-O· + (t-Bu)OO(t-Bu) → products	1.3×10^{-4}	t-Bu$_2$O$_2$/pentane	313	chem.	D.k. of ESR signal in deaerated soln. log A=6.5, E_a = 62.3 kJ mol^{-1}.	68PRO/SOL

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
	Phenoxyl and semiquinone radicals as oxidants						
1	Phenoxyl+4-methylphenoxide $C_6H_5O\cdot + 4\text{-}CH_3C_6H_4O^- \rightleftarrows C_6H_5O^- + 4\text{-}CH_3C_6H_4O\cdot$	1.3×10^9	2×10^7	11–12	p.r.	P.b.k. at 412 nm in N_2O-satd. soln. $I=0.1$.	90LIN/SHE
2	Phenoxyl+tyrosine $C_6H_5O\cdot + TyrO^- \rightleftarrows C_6H_5O^- + TyrO\cdot$	4.9×10^8	2.8×10^7	11–12	p.r.	P.b.k. at 416 nm in N_2O-satd. soln. $I=0.5$.	90LIN/SHE
3	4-Methylphenoxyl+4-methoxyphenol $4\text{-}CH_3C_6H_4O\cdot + 4\text{-}CH_3OC_6H_4O^- \rightleftarrows 4\text{-}CH_3C_6H_4O^- + 4\text{-}CH_3OC_6H_4O\cdot$	1.4×10^9	5.5×10^6	11–12	p.r.	P.b.k. at 425 nm in N_2O-satd. soln. $I=0.2$.	90LIN/SHE
4	3,5-Dimethoxyphenoxyl+4-methoxyphenol $3,5\text{-}(CH_3O)_2C_6H_3O\cdot + 4\text{-}CH_3OC_6H_4O^- \rightleftarrows 3,5\text{-}(CH_3O)_2C_6H_3O^- + 4\text{-}CH_3OC_6H_4O\cdot$	8.0×10^8	1.8×10^6	13.5	p.r.	D.k. at 505 nm in N_2O-satd. soln.	91JOV/TOS
5	4-Aminophenoxyl+4-(N,N-dimethylamino)phenol $4\text{-}H_2NC_6H_4O\cdot + 4\text{-}(CH_3)_2NC_6H_4O^- \rightleftarrows 4\text{-}H_2NC_6H_4O^- + 4\text{-}(CH_3)_2NC_6H_4O\cdot$	5×10^7	1×10^7	13.5	p.r.	P.b.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	82STE/NET
6	1,3-Benzosemiquinone anion+4-(N,N-dimethylamino)phenol $3\text{-}(O^-)C_6H_4O\cdot + 4\text{-}(CH_3)_2NC_6H_4O^- \rightleftarrows 3\text{-}(O^-)C_6H_4O^- + 4\text{-}(CH_3)_2NC_6H_4O\cdot$	$\approx7\times10^7$		13.5	p.r.	P.b.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$. Reported k_r may be incorrect.	82STE/NET
7	Indole-5-oxyl+4-(N,N-dimethylamino)phenol $5\text{-Ind-}O\cdot + 4\text{-}(CH_3)_2NC_6H_4O^- \rightleftarrows 5\text{-Ind-}O^- + 4\text{-}(CH_3)_2NC_6H_4O\cdot$	3×10^7	$\approx3\times10^6$	13.5	p.r.	P.b.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	82STE/NET
8	Tryptophan-5-oxyl+4-(N,N-dimethylamino)phenol $5\text{-Trp-}O\cdot + 4\text{-}(CH_3)_2NC_6H_4O^- \rightleftarrows 5\text{-Trp-}O^- + 4\text{-}(CH_3)_2NC_6H_4O\cdot$	3×10^7	2×10^6	13.5	p.r.	P.b.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	82STE/NET
9	coumarin-7-oxyl+4-(N,N-dimethylamino)phenol $7\text{-coumarin-}O\cdot + 4\text{-}(CH_3)_2NC_6H_4O^- \rightleftarrows 7\text{-coumarin-}O^- + 4\text{-}(CH_3)_2NC_6H_4O\cdot$	2.4×10^8	6×10^5	13.5	p.r.	P.b.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	82STE/NET
10	4-Iodophenoxyl+4-fluorophenoxide $4\text{-}IC_6H_4O\cdot + 4\text{-}FC_6H_4O^- \rightleftarrows 4\text{-}IC_6H_4O^- + 4\text{-}FC_6H_4O\cdot$	1.4×10^9	9×10^7	11–12	p.r.	D.k. at 500 nm in N_2O-satd. soln. $I=0.1$.	90LIN/SHE
11	4-Iodophenoxyl+4-bromophenoxide $4\text{-}IC_6H_4O\cdot + 4\text{-}BrC_6H_4O^- \rightleftarrows 4\text{-}IC_6H_4O^- + 4\text{-}BrC_6H_4O\cdot$	$\approx7\times10^8$	$\approx7\times10^8$	11–12	p.r.	D.k. at 500 nm in N_2O-satd. soln. $I=0.1$.	90LIN/SHE
12	4-Carboxyphenoxyl+4-iodophenoxide $4\text{-}(CO_2^-)C_6H_4O\cdot + 4\text{-}IC_6H_4O^- \rightleftarrows 4\text{-}(CO_2^-)C_6H_4O^- + 4\text{-}IC_6H_4O\cdot$	2.2×10^9	7×10^7	11–12	p.r.	P.b.k. at 500 nm in N_2O-satd. soln. $I=0.1$.	90LIN/SHE
13	4-Methoxyphenoxyl+5-hydroxytryptophan $4\text{-}CH_3OC_6H_4O\cdot + 5\text{-Trp-}O^- \rightleftarrows 4\text{-}CH_3OC_6H_4O^- + 5\text{-Trp-}O\cdot$	9.6×10^8	5×10^5	13.5	p.r.	P.b.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	82STE/NET

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)—Continued

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
14	1,3-Benzosemiquinone anion + 5-hydroxytryptophan 3-$(O^-)C_6H_4O\cdot$ + 5-Trp-O^- ⇄ 3-$(O^-)C_6H_4O^-$ + 5-Trp-O·	4×10^8	5.5×10^5	13.5	p.r.	P.b.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
15	4-Carboxy-1,2-benzosemiquinone anion + Trolox C 3,4-$(O^-)(O\cdot)C_6H_3CO_2^-$ + TxOH ⇄ 3,4-$(OH)_2C_6H_3CO_2^-$ + TxO·	6.1×10^7	5×10^5	7	p.r.	P.b.k. at 425 nm in N_2O-satd. soln. contg. bromide.	94JOV/STE
16	3,4-Dihydroxycinnamate semiquinone anion + Trolox C 3,4-$(O^-)(O\cdot)C_6H_3CH{=}CHCO_2^-$ + TxOH ⇄ 3,4-$(OH)_2C_6H_3CH{=}CHCO_2^-$ + TxO·	2.6×10^5	3×10^4	7	p.r.	P.b.k. at 425 nm in N_2O-satd. soln. contg. bromide.	94JOV/STE
17	Catechin semiquinone anion + Trolox C catechin-O· + TxOH ⇄ catechin-OH + TxO·	2×10^8	6×10^6	7	p.r.	P.b.k. at 425 nm in N_2O-satd. soln. contg. bromide.	94JOV/STE
18	Rutin semiquinone anion + Trolox C rutin-O· + TxOH ⇄ rutin-OH + TxO·	3.6×10^6	4×10^4	7	p.r.	P.b.k. at 425 nm and d.k. at 450 nm in N_2O-satd. soln. contg. bromide.	94JOV/STE
19	Alanyltyrosyl + guanosine anion Alanyltyrosine-O· + Guanosine$^-$ ⇄ Alanyltyrosine-O^- + Guanosine·	1×10^6	1×10^7	7	p.r.	P.b.k. in N_2O-satd. soln. contg. bromide or azide.	86JOV/HAR
20	Tyrosine methyl ester phenoxyl radical + guanosine anion Tyrosine methyl ester-O· + Guanosine$^-$ ⇄ Tyrosine methyl ester-O^- + Guanosine·	5×10^6	8.9×10^6	7	p.r.	P.b.k. in N_2O-satd. soln. contg.3 bromide or azide.	86JOV/HAR
21	4-(*N*-Methylamino)phenoxyl + catechol 4-$(CH_3NH)C_6H_4O\cdot$ + 2-$(O^-)C_6H_4O^-$ ⇄ 4-$(CH_3NH)C_6H_4O^-$ + 2-$(O^-)C_6H_4O\cdot$	3×10^7	4.6×10^5	13.5	p.r.	D.k. at 470 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
22	4-(N,N-Dimethylamino)phenoxyl + catechol 4-$(CH_3)_2NC_6H_4O\cdot$ + 2-$(O^-)C_6H_4O^-$ ⇄ 4-$(CH_3)_2NC_6H_4O^-$ + 2-$(O^-)C_6H_4O\cdot$	3×10^7	2×10^5	13.5	p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
23	2-Acetyl-1,4-benzosemiquinone anion + catechol 2,5-$(O^-)(O\cdot)C_6H_3COCH_3$ + 2-$(O^-)C_6H_4O^-$ ⇄ 2,5-$(O^-)_2C_6H_3COCH_3$ + 2-$(O^-)C_6H_4O\cdot$	1.9×10^7	1.5×10^6	13.5	p.r.	D.k. at 520 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	79STE/NET
24	Trolox phenoxyl radical + catechol TxO· + 2-$(O^-)C_6H_4O^-$ ⇄ TxO^- + 2-$(O^-)C_6H_4O\cdot$	7×10^7	3×10^5	13.5	p.r.	D.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
25	4-Methylphenoxyl + resorcinol 4-$CH_3C_6H_4O\cdot$ + 3-$(O^-)C_6H_4O^-$ ⇄ 4-$CH_3C_6H_4O^-$ + 3-$(O^-)C_6H_4O\cdot$	7.1×10^8	2.7×10^5	>11	p.r.	P.b.k. at 440 nm and d.k. at 385, 400 nm in N_2O-satd. soln. contg. 0.05–0.1 mol L^{-1} azide.	96ARM/SUN

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)—Continued

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
26	Acetaminophenoxyl + resorcinol 4-$CH_3CONHC_6H_4O\cdot$ + 3-$(O^-)C_6H_4O^-$ $\rightleftarrows$ 4-$CH_3CONHC_6H_4O^-$ + 3-$(O^-)C_6H_4O\cdot$	1.7×10^7	2.3×10^6	12.4	p.r.	D.k. at 380 and 520 nm in N_2O-satd. soln. $I=0.3$.	88BIS/TAB
27	4-(*N*-Methylamino)phenoxyl + hydroquinone 4-$(CH_3NH)C_6H_4O\cdot$ + 4-$(O^-)C_6H_4O^-$ $\rightleftarrows$ 4-$(CH_3NH)C_6H_4O^-$ + 4-$(O^-)C_6H_4O\cdot$	$\approx7.5\times10^7$	$\approx3\times10^5$	13.5	p.r.	D.k. at 470 nm and p.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	82STE/NET
28	4-(N,N-Dimethylamino)phenoxyl + hydroquinone 4-$(CH_3)_2NC_6H_4O\cdot$ + 4-$(O^-)C_6H_4O^-$ $\rightleftarrows$ 4-$(CH_3)_2NC_6H_4O^-$ + 4-$(O^-)C_6H_4O\cdot$	1×10^8	3×10^5	13.5	p.r.	D.k. at 490 nm and p.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	82STE/NET
29	1,2-Benzosemiquinone anion + hydroquinone 2-$(O^-)C_6H_4O\cdot$ + 4-$HOC_6H_4O^-$ $\rightleftarrows$ 2-$HOC_6H_4O^-$ + 4-$(O^-)C_6H_4O\cdot$	$<1\times10^5$ $\approx8\times10^5$	 $\approx5\times10^4$	7 11.0	p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET
30	1,2-Benzosemiquinone anion + hydroquinone 2-$(O^-)C_6H_4O\cdot$ + 4-$(O^-)C_6H_4O^-$ $\rightleftarrows$ 2-$(O^-)C_6H_4O^-$ + 4-$(O^-)C_6H_4O\cdot$	2.0×10^6	8.5×10^5	13.5	p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	79STE/NET
31	3-Carboxy-1,2-benzosemiquinone anion + hydroquinone 2,3-$(O^-)(O\cdot)C_6H_3CO_2^-$ + 4-$(O^-)C_6H_4O^-$ $\rightleftarrows$ 2,3-$(O^-)_2C_6H_3CO_2^-$ + 4-$(O^-)C_6H_4O\cdot$	4.2×10^5	9×10^3	13.5	p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	79STE/NET
32	4-Carboxy-1,2-benzosemiquinone anion + hydroquinone 3,4-$(O^-)(O\cdot)C_6H_3CO_2^-$ + 4-$(O^-)C_6H_4O^-$ $\rightleftarrows$ 3,4-$(O^-)_2C_6H_3CO_2^-$ + 4-$(O^-)C_6H_4O\cdot$	6.0×10^6	1.2×10^5	13.5	p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	79STE/NET
33	Pyrogallol semiquinone anion + hydroquinone 1,2,3-$(O^-)_2C_6H_3O\cdot$ + 4-$(O^-)C_6H_4O^-$ $\rightleftarrows$ 1,2,3-$C_6H_3(O^-)_3$ + 4-$(O^-)C_6H_4O\cdot$	$\approx1\times10^5$	$\approx1\times10^5$	13.5	p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	79STE/NET
34	Ellagic acid semiquinone anion + hydroquinone ellagic acid$(O\cdot)$ + 4-$(O^-)C_6H_4O^-$ $\rightleftarrows$ ellagic acid(O^-) + 4-$(O^-)C_6H_4O\cdot$	1.1×10^8	$\approx4\times10^5$	13.5	p.r.	D.k. at 530 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	82STE/NET
35	Quinalizarin semiquinone anion + hydroquinone quinalizarin radical + 4-$(O^-)C_6H_4O^-$ $\rightleftarrows$ quinalizarin + 4-$(O^-)C_6H_4O\cdot$	2.5×10^7	3×10^6	13.5	p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. $I=0.5$.	82STE/NET

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)—Continued

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
36	1,3-Benzosemiquinone anion + 2,3-dihydroxybenzoate ion 3-$(O^-)C_6H_4O\cdot$ + 2,3-$(O^-)_2C_6H_3CO_2^-$ $\rightleftarrows$ 3-$(O^-)C_6H_4O^-$ + 2,3-$(O^-)(O\cdot)C_6H_3CO_2^-$	4.7×10^7	5.2×10^4	13.5	p.r.	D.k. at 450 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	79STE/NET
37	1,3-Benzosemiquinone anion + 3,4-dihydroxybenzoate ion 3-$(O^-)C_6H_4O\cdot$ + 3,4-$(O^-)_2C_6H_3CO_2^-$ $\rightleftarrows$ 3-$(O^-)C_6H_4O^-$ + 3,4-$(O^-)(O\cdot)C_6H_3CO_2^-$	2.5×10^8	1.9×10^5	13.5	p.r.	D.k. at 450 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	79STE/NET
38	5-Carboxy-1,3-benzosemiquinone anion + 3,4-dihydroxybenzoate ion 3,5-$(O^-)(O\cdot)C_6H_3CO_2^-$ + 3,4-$(O^-)_2C_6H_3CO_2^-$ $\rightleftarrows$ 3,5-$(O^-)_2C_6H_3CO_2^-$ + 3,4-$(O^-)(O\cdot)C_6H_3CO_2^-$	$\approx4.2\times10^7$	$\approx1\times10^5$	13.5	p.r.	D.k. at 450 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	79STE/NET
39	4-(N,N-dimethylamino)phenoxyl + norepinephrin 4-$(CH_3)_2NC_6H_4O\cdot$ + 3,4-$(O^-)_2C_6H_3CH(CH_2NH_2)OH$ $\rightleftarrows$ 4-$(CH_3)_2NC_6H_4O^-$ + 3,4-$(O^-)(O\cdot)C_6H_3CH(CH_2NH_2)OH$	3×10^7	2×10^5	13.5	p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
40	4-(N,N-Dimethylamino)phenoxyl + dopamine 4-$(CH_3)_2NC_6H_4O\cdot$ + 3,4-$(O^-)_2C_6H_3CH_2CH_2NH_2$ $\rightleftarrows$ 4-$(CH_3)_2NC_6H_4O^-$ + 3,4-$(O^-)(O\cdot)C_6H_3CH_2CH_2NH_2$	9×10^7	3×10^5	13.5	p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
41	4-(N,N-Dimethylamino)phenoxyl + 3,4-dihydroxycinnamate anion 4-$(CH_3)_2NC_6H_4O\cdot$ + 3,4-$(O^-)_2C_6H_3CH{=}CHCO_2^-$ $\rightleftarrows$ 4-$(CH_3)_2NC_6H_4O^-$ + 3,4-$(O^-)(O\cdot)C_6H_3CH{=}CHCO_2^-$	1.5×10^8	5×10^6	13.5	p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
42	4-(Dimethylamino)phenoxyl + 2-t-Butyl-1,4-hydroquinone 4-$((CH_3)_2N)C_6H_4O\cdot$ + 2-$((CH_3)_3C)$-1,4-$C_6H_3(O^-)_2$ $\rightleftarrows$ 4-$((CH_3)_2N)C_6H_4O^-$ + 2-$((CH_3)_3C)$-1,4-$C_6H_3(O^-)(O\cdot)$	2.9×10^8	2.7×10^5	13.5	p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. ethylene glycol.	95DOH/BER
43	1,2-Benzosemiquinone anion + 2,5-dihydroxybenzoate ion 2-$(O^-)C_6H_4O\cdot$ + 2,5-$(O^-)_2C_6H_3CO_2^-$ $\rightleftarrows$ 2-$(O^-)C_6H_4O^-$ + 2,5-$(O^-)(O\cdot)C_6H_3CO_2^-$	1.8×10^5	1.2×10^5	13.5	p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	79STE/NET
44	1,2-Benzosemiquinone anion + 2,5-dihydroxyphenylacetate ion 2-$(O^-)C_6H_4O\cdot$ + 2,5-$(O^-)_2C_6H_4CH_2CO_2^-$ $\rightleftarrows$ 2-$(O^-)C_6H_4O^-$ + 2,5-$(O^-)(O\cdot)C_6H_4CH_2CO_2^-$	3.5×10^6	1×10^5	13.5	p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
45	1,2-Benzosemiquinone anion + methoxyhydroquinone 2-$(O^-)C_6H_4O\cdot$ + 2,5-$(O^-)_2C_6H_3OCH_3$ $\rightleftarrows$ 2-$(O^-)C_6H_4O^-$ + 2,5-$(O^-)(O\cdot)C_6H_3OCH_3$	2.0×10^7	$\approx1.3\times10^5$	13.5	p.r.	P.b.k. at 430 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	79STE/NET

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)—Continued

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
46	4-Carboxy-1,2-benzosemiquinone anion + durohydroquinone 3,4-$(O^-)(O\cdot)C_6H_3CO_2^-$ + 1,4-$(O^-)_2C_6(CH_3)_4$ $\rightleftarrows$ 3,4-$(O^-)_2C_6H_3CO_2^-$ + 1,4-$(O^-)(O\cdot)C_6(CH_3)_4$	7.5×10^7	1×10^5	13.5	p.r.	P.b.k. at 445 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	79STE/NET
47	4-(N,N-Dimethylamino)phenoxyl + 5-hydroxydopamine 4-$(CH_3)_2NC_6H_4O\cdot$ + $(O^-)_3C_6H_2CH_2CH_2NH_2$ $\rightleftarrows$ 4-$(CH_3)_2NC_6H_4O^-$ + $(O^-)_2(O\cdot)C_6H_2CH_2CH_2NH_2$	1.2×10^7	9×10^4	13.5	p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
48	Rutin semiquinone + methyl gallate rutin-O· + 3,4,5-$(OH)_3C_6H_2CO_2CH_3$ $\rightleftarrows$ rutin-OH + 3,4,5-$(OH)(O^-)(O\cdot)C_6H_2CO_2CH_3$	8.3×10^5	7×10^4	7	p.r.	Kinetics in N_2O-satd. soln. contg. azide.	95JOV/HAR
49	1,4-Benzosemiquinone anion + ethyl gallate 4-$(O^-)C_6H_4O\cdot$ + 3,4,5-$(OH)_3C_6H_2CO_2C_2H_5$ $\rightleftarrows$ 4-$(O^-)C_6H_4O^-$ + 3,4,5-$(OH)(O^-)(O\cdot)C_6H_2CO_2C_2H_5$	3.1×10^5	2×10^4	13.5	p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
50	4-Methoxyphenoxyl + 4,4′-biphenol 4-$CH_3OC_6H_4O\cdot$ + 4,4′-$(O^-)C_6H_4C_6H_4O^-$ $\rightleftarrows$ 4-$CH_3OC_6H_4O^-$ + 4,4′-$(O^-)C_6H_4C_6H_4O\cdot$	1.6×10^9	2.7×10^7	12	p.r.	P.b.k. in N_2O-satd. soln. contg. 1 mol L^{-1} N_3^-, 3–30 mmol L^{-1} 4-methoxyphenol, and 0.07–0.28 mmol L^{-1} 4,4′-biphenol. I = 1.	02JON/LIN
51	4-(N,N-Dimethylamino)phenoxyl + catechin (2-(3,4-dihydroxyphenyl)-3,4-dihydro-2H-1-benzopyran-3,5,7-triol) 4-$(CH_3)_2NC_6H_4O\cdot$ + catechin $\rightleftarrows$ 4-$(CH_3)_2NC_6H_4O$- + catechin·	1.1×10^7	4.5×10^5	13.5	p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
52	4-(N,N-Dimethylamino)phenoxyl + epicatechin 4-$(CH_3)_2NC_6H_4O\cdot$ + epicatechin $\rightleftarrows$ 4-$(CH_3)_2NC_6H_4O$- + epicatechin·	3×10^7	4×10^5	13.5	p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
53	1,4-Benzosemiquinone anion + quercetin(3,3′,4′,5,7-pentahydroxyflavone) 4-$(O^-)C_6H_4O\cdot$ + quercetin(O^-) $\rightleftarrows$ 4-$(O^-)C_6H_4O$- + quercetin(O·)	$\approx4.5\times10^6$	$\approx2\times10^5$	13.5	p.r.	P.b.k. at 530 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
54	Hesperidin semiquinone anion + rutin hesperidin-O· + rutin-OH $\rightleftarrows$ hesperidin-OH + rutin-O·	5.0×10^7	4×10^5	7	p.r.	P.b.k. in N_2O-satd. soln. contg. bromide.	94JOV/STE
55	Trolox phenoxyl radical + epigallocatechin TxO· + epigallocatechin-OH $\rightleftarrows$ TxOH + epigallocatechin-O·	3.3×10^4	2×10^3	7	p.r.	Kinetics in N_2O-satd. soln. contg. azide.	95JOV/HAR
56	Trolox phenoxyl radical + epigallocatechin gallate TxO· + epigallocatechin gallate-OH $\rightleftarrows$ TxOH + epigallocatechin gallate-O·	3.3×10^4	3×10^3	7	p.r.	Kinetics in N_2O-satd. soln. contg. azide.	95JOV/HAR

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)—Continued

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
57	4-Methoxyphenoxyl + 1,4-phenylenediamine 4-$CH_3OC_6H_4O\cdot$ + 4-$H_2NC_6H_4NH_2$ $\rightleftarrows$ 4-$CH_3OC_6H_4O^-$ + 4-$H_2NC_6H_4NH\cdot$	6.6×10^8		13.5	p.r.	P.b.k. at 480 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5. Reported k_{rev} probably incorrect.	79STE/NET
58	4-(N,N-Dimethylamino)phenoxyl + 1,4-phenylenediamine 4-$(CH_3)_2NC_6H_4O\cdot$ + 4-$H_2NC_6H_4NH_2$ $\rightleftarrows$ 4-$(CH_3)_2NC_6H_4O^-$ + 4-$H_2NC_6H_4NH\cdot$	4×10^5	1.1×10^8	13.5	p.r.	P.b.k. at 500 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
59	4-Methoxyphenoxyl + TMPD 4-$CH_3OC_6H_4O\cdot$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$ $\rightleftarrows$ 4-$CH_3OC_6H_4O^-$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2\cdot^+$	2.2×10^9	3.7×10^5	13.5	p.r.	P.b.k. at 565 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	79STE/NET
60	4-Aminophenoxyl + TMPD 4-$H_2NC_6H_4O\cdot$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$ $\rightleftarrows$ 4-$H_2NC_6H_4O^-$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2\cdot^+$	3.4×10^7	1.3×10^8	>11	p.r.	D.k. at 520 nm and p.b.k. at 435 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} azide.	96ARM/SUN
61	4-(N-Methylamino)phenoxyl + TMPD 4-$CH_3NHC_6H_4O\cdot$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$ $\rightleftarrows$ 4-$CH_3NHC_6H_4O^-$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2\cdot^+$	1×10^7	1×10^9	13.5	p.r.	D.k. at 565 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
62	4-(N,N-Dimethylamino)phenoxyl + TMPD 4-$(CH_3)_2NC_6H_4O\cdot$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$ $\rightleftarrows$ 4-$(CH_3)_2NC_6H_4O^-$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2\cdot^+$	1×10^7	5×10^8	13.5	p.r.	D.k. at 565 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
63	Indole-5-oxyl + TMPD 5-Ind-O$\cdot$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$ $\rightleftarrows$ 5-Ind-O$^-$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2\cdot^+$	1.1×10^8	5×10^6	13.5	p.r.	P.b.k. at 565 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
		8.0×10^8	7×10^6	12.2	p.r.	P.b.k. in N_2O-satd. soln. contg. 0.9 mol L^{-1} ethylene glycol.	90JOV/STE
64	Tryptophan-5-oxyl + TMPD 5-Trp-O$\cdot$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2$ $\rightleftarrows$ 5-Trp-O$^-$ + 4-$(CH_3)_2NC_6H_4N(CH_3)_2\cdot^+$	1.0×10^8	7×10^6	13.5	p.r.	P.b.k. at 565 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.5.	82STE/NET
65	4-Nitrophenoxyl + N-methylindole 4-$O_2NC_6H_4O\cdot$ + N-Me-indole $\rightleftarrows$ 4-$O_2NC_6H_4O^-$ + N-Me-indole$\cdot^+$	$\approx3\times10^8$	$\approx1.1\times10^9$	11-12	p.r.	D.k. at 580 nm in N_2O-satd. soln.	90LIN/SHE
66	Tyrosyl + tryptophan TyrO$\cdot$ + TrpH $\rightleftarrows$ TyrO$^-$ + Trp$\cdot$	2.4×10^6	1×10^5	13	p.r.	P.b.k. in N_2O-satd. soln. contg. bromide or azide.	86JOV/HAR

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)—Continued

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
67	N-Acetyltyrosinamide phenoxyl + tryptophan N-Ac-tyrosinamide-O· + TrpH ⇄ N-Ac-tyrosinamide-O$^-$ + Trp·	9×10^6	2×10^5	12	p.r.	P.b.k. in N_2O-satd. soln. contg. bromide or azide.	86JOV/HAR
68	Tyrosine methyl ester phenoxyl + tryptophan tyrosine methyl ester-O· + TrpH ⇄ tyrosine methyl ester-O$^-$ + Trp·	5×10^6	1×10^5	13	p.r.	P.b.k. in N_2O-satd. soln. contg. bromide or azide.	86JOV/HAR
69	N-Acetyltyrosinamide phenoxyl + tryptophanamide N-Ac-tyrosinamide-O· + tryptophanamide ⇄ N-Ac-tyrosinamide-O$^-$ + tryptophanamide·	9×10^6	3×10^6	12	p.r.	P.b.k. in N_2O-satd. soln. contg. bromide or azide.	86JOV/HAR
70	2,2,5,7,8-Pentamethylchroman-6-oxyl + glutathione thiolate anion HPMC· + GS$^-$ ⇄ GS· + HPMC$^-$	1.3×10^6	5.0×10^6	8.0–8.5	p.r.	D.k. and p.b.k. in soln. contg. acetonitrile and azide. Derived from fitting to a complex mechanism.	94BOR/MIC
71	Trolox phenoxyl radical + glutathione thiolate anion TxO· + GS$^-$ ⇄ GS· + TxO$^-$	1.8×10^6	6.0×10^8	8.0–8.5	p.r.	D.k. and p.b.k. in soln. contg. acetonitrile and azide. Derived from fitting to a complex mechanism.	94BOR/MIC
72	Phenoxyl + thiophenol $C_6H_5O\cdot + C_6H_5S^- \rightleftarrows C_6H_5O^- + C_6H_5S\cdot$	1.5×10^9	2.9×10^7	>11	p.r.	P.b.k. at 460 nm in N_2O-satd. soln. contg. 0.05–0.1 mol L^{-1} azide.	96ARM/SUN
73	Phenoxyl + 4-bromothiophenol $C_6H_5O\cdot + 4\text{-}BrC_6H_4S^- \rightleftarrows C_6H_5O^- + 4\text{-}BrC_6H_4S\cdot$	1.7×10^9	7.4×10^7	>11	p.r.	P.b.k. at 510 nm in N_2O-satd. soln. contg. 0.05–0.1 mol L^{-1} azide.	96ARM/SUN
74	4-Methylphenoxyl + 4-methylthiophenol $4\text{-}CH_3C_6H_4O\cdot + 4\text{-}CH_3C_6H_4S^- \rightleftarrows 4\text{-}CH_3C_6H_4O^- + 4\text{-}CH_3C_6H_4S\cdot$	6.4×10^8	1.1×10^8	>11	p.r.	P.b.k. at 500 nm in N_2O-satd. soln. contg. 0.05–0.1 mol L^{-1} azide.	96ARM/SUN
75	4-Methoxyphenoxyl + 4-methoxythiophenol $4\text{-}CH_3OC_6H_4O\cdot + 4\text{-}CH_3OC_6H_4S^- \rightleftarrows 4\text{-}CH_3OC_6H_4O^- + 4\text{-}CH_3OC_6H_4S\cdot$	1.6×10^8	4.6×10^8	>11	p.r.	P.b.k. at 415 nm and d.k. at 530 nm in N_2O-satd. soln. contg. 0.05–0.1 mol L^{-1} azide.	96ARM/SUN
76	4-Aminophenoxyl + 4-aminothiophenol $4\text{-}H_2NC_6H_4O\cdot + 4\text{-}H_2NC_6H_4S^- \rightleftarrows 4\text{-}H_2NC_6H_4O^- + 4\text{-}H_2NC_6H_4S\cdot$	3.5×10^6	2.8×10^8	>11	p.r.	P.b.k. at 435 nm and d.k. at 600 nm in N_2O-satd. soln. contg. 0.05–0.1 mol L^{-1} azide.	96ARM/SUN
77	1,3-Benzosemiquinone anion + 4-aminothiophenol $3\text{-}(O^-)C_6H_4O\cdot + 4\text{-}H_2NC_6H_4S^- \rightleftarrows 3\text{-}(O^-)C_6H_4O^- + 4\text{-}H_2NC_6H_4S\cdot$	1.8×10^8	3×10^6	>11	p.r.	P.b.k. at 600 nm and d.k. at 440 nm in N_2O-satd. soln. contg. 0.05–0.1 mol L^{-1} azide.	96ARM/SUN

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)—Continued

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
78	4-Aminophenoxyl + 4-hydroxythiophenol 4-$H_2NC_6H_4O\cdot$ + 4-$(O^-)C_6H_4S^-$ $\rightleftarrows$ 4-$H_2NC_6H_4O^-$ + 4-$(O^-)C_6H_4S\cdot$	2.9×10^7	3.2×10^6	>11	p.r.	P.b.k. at 590 nm and d.k. at 450 nm in N_2O-satd. soln. contg. 0.05–0.1 mol L^{-1} azide.	96ARM/SUN
79	1,4-Benzosemiquinone anion + 4-hydroxythiophenol 4-$(O^-)C_6H_4O\cdot$ + 4-$(O^-)C_6H_4S^-$ $\rightleftarrows$ 4-$(O^-)C_6H_4O^-$ + 4-$(O^-)C_6H_4S\cdot$	$\approx7\times10^3$	3.9×10^6	>11	p.r.	P.b.k. at 427 nm and d.k. at 595 nm in N_2O-satd. soln. contg. 0.05–0.1 mol L^{-1} azide.	96ARM/SUN
80	1,3-Benzosemiquinone anion + 1,4-dimercaptobenzene 3-$(O^-)C_6H_4O\cdot$ + 4-$(S^-)C_6H_4S^-$ $\rightleftarrows$ 3-$(O^-)C_6H_4O^-$ + 4-$(S^-)C_6H_4S\cdot$	5.3×10^8	1.3×10^6	13	p.r.	P.b.k. at 390 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol. I = 0.2.	93ARM/SUN
81	4-Methoxyphenoxyl + promethazine 4-$CH_3OC_6H_4O\cdot$ + Pz $\rightleftarrows$ 4-$CH_3OC_6H_4OH$ + Pz$\cdot^+$	7.3×10^5	2.2×10^6	3	p.r.	D.k. in aerated soln. contg. 1 mol L^{-1} 2-PrOH, 0.05 mol L^{-1} acetone, and 0.05 mol L^{-1} CCl_4.	90JOV/STE
82	3,4,5-Trimethoxyphenoxyl + promethazine 3,4,5-$(CH_3O)_3C_6H_2O\cdot$ + Pz $\rightleftarrows$ 3,4,5-$(CH_3O)_3C_6H_2OH$ + Pz$\cdot^+$	1×10^6	2.1×10^7	3	p.r.	Kinetics in N_2O-satd. soln.	91JOV/TOS
83	2-(2-Hydroxyphenyl)phenoxyl + promethazine 2,2′-$HOC_6H_4C_6H_4O\cdot$ + Pz $\rightleftarrows$ 2,2′-$HOC_6H_4C_6H_4O^-$ + Pz$\cdot^+$	1.9×10^8	6.7×10^7	9.2	p.r.	P.b.k. in N_2O-satd. soln. contg. azide and borate. I = 0.02. (Values in doubt, solubility of promethazine at this pH very low.)	02JON/LIN
84	Indole-5-oxyl + promethazine 5-Ind-O$\cdot$ + Pz $\rightleftarrows$ 5-Ind-OH + Pz$\cdot^+$	1.6×10^6	1.8×10^8	3	p.r.	D.k. in aerated soln. contg. 1 mol L^{-1} 2-PrOH, 0.05 mol L^{-1} acetone, and 0.05 mol L^{-1} CCl_4.	90JOV/STE
85	Tryptophan-5-oxyl + promethazine 5-Trp-O$\cdot$ + Pz $\rightleftarrows$ 5-Trp-OH + Pz$\cdot^+$	1.0×10^6	1.1×10^8	3	p.r.	D.k. in aerated soln. contg. 1 mol L^{-1} 2-PrOH, 0.05 mol L^{-1} acetone, and 0.05 mol L^{-1} CCl_4.	90JOV/STE
86	Tryptamine-5-oxyl + promethazine 5-tryptamine-O$\cdot$ + Pz $\rightleftarrows$ 5-tryptamine-OH + Pz$\cdot^+$	2.6×10^5	6.3×10^7	3	p.r.	D.k. in aerated soln. contg. 1 mol L^{-1} 2- PrOH, 0.05 mol L^{-1} acetone, and 0.05 mol L^{-1} CCl_4.	90JOV/STE
87	1,2-Benzosemiquinone anion + ascorbate ion 2-$(O^-)C_6H_4O\cdot$ + $AscH^-$ $\rightleftarrows$ 2-HOC_6H_4O- + Asc$\cdot^-$ + H^+	$\approx5\times10^5$	$\approx5\times10^4$	11	p.r.	P.b.k. at 360 nm in N_2O-satd. soln. contg. 1 mol L^{-1} ethylene glycol.	79STE/NET
88	Trolox phenoxyl radical + ascorbate ion						

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)—Continued

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
	$TxO\cdot + AscH^- \rightleftarrows TxOH + Asc\cdot^-$	1.1×10^7	1.0×10^4	8.3	p.r.	D. k. at 440 nm in N_2O-satd. soln. contg. azide. Derived from fitting to a complex mechanism.	95BOR/MIC
89	Dihydroquercetin semiquinone + ascorbate ion Dihydroquercetin-$O\cdot + AscH^-$ $\rightleftarrows$ dihydroquercetin-$O^- + Asc\cdot^- + H^+$	1.6×10^5	1.2×10^7	8.5	p.r.	Decay and formation kinetics at 367 nm in N_2O-satd. soln. contg. azide. Derived from fitting to a complex mechanism.	95BOR/MIC
90	Kaempferol semiquinone anion + ascorbate ion Kaempferol-$O\cdot + AscH^-$ $\rightleftarrows$ kaempferol-$O^- + Asc\cdot^- + H^+$	5.2×10^6	2.8×10^6	8.5	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. azide. Derived from fitting to a complex mechanism.	95BOR/MIC
91	Luteolin semiquinone anion + ascorbate ion Luteolin-$O\cdot + AscH^- \rightleftarrows$ luteolin-$O^- + Asc\cdot^- + H^+$	9.9×10^6	1.6×10^5	8.5	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. azide. Derived from fitting to a complex mechanism.	95BOR/MIC
92	Fisetin semiquinone anion + ascorbate ion Fisetin-$O\cdot + AscH^- \rightleftarrows$ fisetin-$O^- + Asc\cdot^- + H^+$	8.7×10^4	3.9×10^4	8.5	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. azide. Derived from fitting to a complex mechanism.	95BOR/MIC
93	Quercetin semiquinone anion + ascorbate ion Quercetin-$O\cdot + AscH^- \rightleftarrows$ quercetin-$O^- + Asc\cdot^- + H^+$	4.8×10^6	1.6×10^3	8.5	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. azide. Derived from fitting to a complex mechanism.	95BOR/MIC
94	Rutin semiquinone anion + ascorbate ion Rutin-$O\cdot + AscH^- \rightleftarrows$ rutin-$O^- + Asc\cdot^- + H^+$	1.3×10^6	5.2×10^4	8.5	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. azide. Derived from fitting to a complex mechanism.	95BOR/MIC

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)—Continued

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
95	Luteolin semiquinone anion + dehydroascorbate ion Luteolin-O· + dehydroascorbate ion $\rightleftarrows$ luteolin = O + Asc·$^-$	1.7×10^6	1.7×10^7	8.5	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. azide. Derived from fitting to a complex mechanism.	95BOR/MIC
96	Fisetin semiquinone anion + dehydroacsorbate ion Fisetin-O· + dehydroascorbate ion $\rightleftarrows$ fisetin=O + Asc·$^-$	6.9×10^4	3.8×10^3	8.5	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. azide. Derived from fitting to a complex mechanism.	95BOR/MIC
97	Quercetin semiquinone anion + dehydroascorbate ion Quercetin-O· + dehydroascorbate ion $\rightleftarrows$ quercetin=O + Asc·$^-$	1.2×10^7	1.2×10^6	8.5	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. azide. Derived from fitting to a complex mechanism.	95BOR/MIC
98	Rutin semiquinone anion + dehydroascorbate ion Rutin-O· + dehydroascorbate ion$\rightleftarrows$ rutin=O + Asc·$^-$	1.7×10^5	4.1×10^4	8.5	p.r.	Decay and formn. kinetics at 370 nm and 460–590 nm in N_2O-satd. soln. contg. azide. Derived from fitting to a complex mechanism.	95BOR/MIC
	Semiquinone radicals as reductants						
99	2,5-Diaziridinyl-3,6-bis(carboethoxy)amino-1,4-benzosemiquinone anion + Duroquinone AZ(O$^-$)O· + $C_6(CH_3)_4(O)_2$ $\rightleftarrows$ AZ(O)$_2$ + $C_6(CH_3)_4$(O$^-$)O·	3.8×10^7	7.8×10^8	7	p.r.	P.b.k. at 430 nm in deoxygenated soln. contg. t-BuOH.	81SVI/POW
100	9,10-Anthrasemiquinone-2-sulfonate anion + Duroquinone 2-(SO_3^-)-9,10-An(O$^-$)O· + $C_6(CH_3)_4(O)_2$ $\rightleftarrows$ 2-(SO_3^-)-9,10-An(O)$_2$ + $C_6(CH_3)_4$(O$^-$)O·	4×10^8	1.6×10^6	7	p.r.	P.b.k. at 445 nm in deoxygenated soln. contg. 0.1–0.2 mol L^{-1} 2-PrOH.	75MEI/NET
101	Adriamycin semiquinone anion + Duroquinone Adria(O$^-$)O· + $C_6(CH_3)_4(O)_2$ $\rightleftarrows$ Adria(O)$_2$ + $C_6(CH_3)_4$(O$^-$)O·	2.2×10^9	3.8×10^8	7	p.r.	P.b.k. at 430 nm and d.k. at 660 nm in deoxygenated soln. contg. 2-PrOH.	81SVI/POW
102	Daunomycin semiquinone anion + Duroquinone Dauno(O$^-$)O· + $C_6(CH_3)_4(O)_2$ $\rightleftarrows$ Dauno(O)$_2$ + $C_6(CH_3)_4$(O$^-$)O·	2.6×10^9	2.4×10^8	7	p.r.	P.b.k. at 430 nm and d.k. at 700 nm in deoxygenated soln. contg. t-BuOH.	81SVI/POW

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)—Continued

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
103	Mitomycin C semiquinone anion + Duroquinone $Mito(O^-)O\cdot + C_6(CH_3)_4(O)_2 \rightleftarrows Mito(O)_2 + C_6(CH_3)_4(O^-)O\cdot$	4.2×10^8	1.5×10^8	7	p.r.	P.b.k. at 430 nm in deoxygenated soln. contg. t-BuOH.	81SVI/POW
104	1,4-Benzosemiquinone + Tetrafluoro-1,4-benzoquinone (fluoranil) $1,4\text{-}C_6H_4(OH)O\cdot + 1,4\text{-}C_6F_4(O)_2 \rightleftarrows 1,4\text{-}C_6H_4(O)_2 + 1,4\text{-}C_6F_4(O^-)O\cdot + H^+$	4.8×10^7	3.7×10^8	1.7	p.r.	D.k. at 410 nm and p.b.k. at 435 nm in deoxygenated soln. contg. 1.3 mol L^{-1} 2-PrOH.	94SHO/MIT
105	9,10-Anthrasemiquinone-2-sulfonate anion + Tetrafluoro-1,4-benzoquinone $2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O^-)O\cdot + 4\text{-}(O)C_6F_4O \rightleftarrows 2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O)_2 + 4\text{-}(O^-)C_6F_4O\cdot$	2.6×10^9		5.6	p.r.	D.k. at 500 nm.	94SHO/MIT
106	Mitomycin C semiquinone anion + Benzyl viologen dication $Mito(O^-)O\cdot + BV^{2+} \rightleftarrows Mito(O)_2 + BV\cdot^+$	4.6×10^7	4.1×10^9	7	p.r.	D.k. at 600 nm in deoxygenated soln. contg. 2-PrOH.	81SVI/POW
107	Adrenochrome semiquinone anion + Benzyl viologen dication $Adr(O^-)O\cdot + BV^{2+} \rightleftarrows Adr(O)_2 + BV\cdot^+$	1.4×10^7	7.6×10^8	7	p.r.	D.k. at 600 nm in deoxygenated soln. contg. 2-PrOH.	81SVI/POW
108	1,4-Bis[(2-hydroxyethyl)amino]ethylamino-9,10-anthrasemiquinone anion + Benzyl viologen dication $An(O^-)O\cdot + BV^{2+} \rightleftarrows An(O)_2 + BV\cdot^+$	6.8×10^7	8.6×10^7	7	p.r.	D.k. at 600 nm in deoxygenated soln. contg. 2-PrOH.	81SVI/POW
109	9,10-Anthrasemiquinone-2-sulfonate anion + Nitrobenzene $2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O^-)O\cdot + C_6H_5NO_2 \rightleftarrows 2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O)_2 + C_6H_5NO_2\cdot^-$	8.8×10^6	5.4×10^8	7	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.1–0.2 mol L^{-1} 2-PrOH.	75MEI/NET
110	Durosemiquinone anion + 4-Nitroacetophenone $C_6(CH_3)_4(O^-)O\cdot + 4\text{-}(CH_3CO)C_6H_4NO_2 \rightleftarrows C_6(CH_3)_4(O)_2 + 4\text{-}(CH_3CO)C_6H_4NO_2\cdot^-$	5.6×10^6	7×10^8	7	p.r.	P.b.k. at 445 nm in deoxygenated soln. contg. 0.1–0.2 mol L^{-1} 2-PrOH.	75MEI/NET
111	Durosemiquinone anion + 5-Nitrofuran-2-carboxylate anion $C_6(CH_3)_4(O^-)O\cdot + Fu\text{-}NO_2 \rightleftarrows C_6(CH_3)_4(O)_2 + Fu\text{-}NO_2\cdot^-$	2×10^7	5×10^8	7	p.r.	P.b.k. at 445 nm in deoxygenated soln. contg. 0.1–0.2 mol L^{-1} 2-PrOH.	75MEI/NET
112	Durosemiquinone anion + 2-Nitrothiophene $C_6(CH_3)_4(O^-)O\cdot + T\text{-}NO_2 \rightleftarrows C_6(CH_3)_4(O)_2 + T\text{-}NO_2\cdot^-$	1.9×10^6	8×10^8	7	p.r.	P.b.k. at 445 nm in deoxygenated soln. contg. 0.1–0.2 mol L^{-1} 2-PrOH.	75MEI/NET
113	9,10-Anthrasemiquinone-2-sulfonate anion + 2-Nitroimidazole $2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O^-)O\cdot + Im\text{-}NO_2 \rightleftarrows 2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O)_2 + Im\text{-}NO_2\cdot^-$	2.0×10^7 7×10^5	1.3×10^8 1.3×10^8	7.0 9.2	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 1 mol L^{-1} 2-PrOH.	76WAR/CLA

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)—Continued

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
114	Durosemiquinone anion + 1-(2′-hydroxy-3′-methoxypropyl)-2-nitroimidazole $C_6(CH_3)_4(O^-)O\cdot + Im\text{-}NO_2 \rightleftarrows C_6(CH_3)_4(O)_2 + Im\text{-}NO_2\cdot^-$	2×10^6	3×10^8	7	p.r.	P.b.k. at 445 nm in deoxygenated soln. contg. 0.1–0.2 mol L^{-1} 2-PrOH.	75MEI/NET
		1×10^6	2.9×10^8	7.0	p.r.	P.b.k. at 445 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH.	76WAR/CLA
115	9,10-Anthrasemiquinone-2-sulfonate anion + 1-(2′-hydroxy-3′-methoxypropyl)-2-nitroimidazole $2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O^-)O\cdot + Im\text{-}NO_2 \rightleftarrows 2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O)_2 + Im\text{-}NO_2\cdot^-$	1.5×10^8	3.0×10^8	7.0	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.5 mol L^{-1} t-BuOH.	76WAR/CLA
116	9,10-Anthrasemiquinone-2-sulfonate anion + 1-carbomethoxyethyl-5-methyl-2-nitroimidazole $2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O^-)O\cdot + Im\text{-}NO_2 \rightleftarrows 2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O)_2 + Im\text{-}NO_2\cdot^-$	6×10^7	4.5×10^8	7.0	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH.	76WAR/CLA
117	9,10-Anthrasemiquinone-2-sulfonate anion + 4-Nitroimidazole $2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O^-)O\cdot + Im\text{-}NO_2 \rightleftarrows 2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O)_2 + Im\text{-}NO_2\cdot^-$	1.7×10^6	7.9×10^8	7.0	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.5 mol L^{-1} t-BuOH.	76WAR/CLA
118	9,10-Anthrasemiquinone-2-sulfonate anion + 1-methyl-5-chloro-4-nitroimidazole $2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O^-)O\cdot + Im\text{-}NO_2 \rightleftarrows 2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O)_2 + Im\text{-}NO_2\cdot^-$	4.5×10^6	1.4×10^9	7.0	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.5 mol L^{-1} t-BuOH.	76WAR/CLA
119	9,10-Anthrasemiquinone-2-sulfonate anion + 2-Methyl-5-nitroimidazole $2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O^-)O\cdot + Im\text{-}NO_2 \rightleftarrows 2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O)_2 + Im\text{-}NO_2\cdot^-$	1.8×10^6	1.0×10^9	7	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.1–0.2 mol L^{-1} 2-PrOH.	75MEI/NET
120	9,10-Anthrasemiquinone-2-sulfonate anion + 1-(2-N-mopholinoethyl)-5-nitroimidazole $2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O^-)O\cdot + Im\text{-}NO_2 \rightleftarrows 2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O)_2 + Im\text{-}NO_2\cdot^-$	2.6×10^7	7.6×10^8	7.0	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.5 mol L^{-1} t-BuOH.	76WAR/CLA
121	9,10-Anthrasemiquinone-2-sulfonate anion + 1-(2-ethylsulfonylethyl)-5-nitroimidazole $2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O^-)O\cdot + Im\text{-}NO_2 \rightleftarrows 2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O)_2 + Im\text{-}NO_2\cdot^-$	2.4×10^7	9.6×10^8	7.0	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.5 mol L^{-1} t-BuOH.	76WAR/CLA
122	9,10-Anthrasemiquinone-2-sulfonate anion + 1-(3-chloro-2-hydroxypropyl)-2-methyl-5-nitroimidazole $2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O^-)O\cdot + Im\text{-}NO_2 \rightleftarrows 2\text{-}(SO_3^-)\text{-}9,10\text{-}An(O)_2 + Im\text{-}NO_2\cdot^-$	1.9×10^7	8.4×10^8	7.0	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH.	76WAR/CLA

TABLE 9. Electron transfer equilibrium reactions of phenoxyl and semiquinone radicals (in water at room temperature)—Continued

No.	Reactants Reaction	k_f (L mol^{-1} s^{-1})	k_r (L mol^{-1} s^{-1})	pH	Method	Comments	Reference
123	9,10-Anthrasemiquinone-2-sulfonate anion + 1,2-Dimethyl-5-nitroimidazole 2-(SO_3^-)-9,10-An(O^-)O· + Im-NO_2 $\rightleftarrows$ 2-(SO_3^-)-9,10-An(O)$_2$ + Im-NO_2·$^-$	2.0×10^7	1.2×10^9	7.0	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.2 mol L^{-1} 2-PrOH.	76WAR/CLA
124	9,10-Anthrasemiquinone-2-sulfonate anion + 1-(2-hydroxy-3-methoxypropyl)-2-methyl-5-nitroimidazole 2-(SO_3^-)-9,10-An(O^-)O· + Im-NO_2 $\rightleftarrows$ 2-(SO_3^-)-9,10-An(O)$_2$ + Im-NO_2·$^-$	1.0×10^7	7.1×10^8	7.0	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.5 mol L^{-1} t-BuOH.	76WAR/CLA
125	9,10-Anthrasemiquinone-2-sulfonate anion + 1-(2-hydroxyethyl)-2-methyl-5-nitroimidazole 2-(SO_3^-)-9,10-An(O^-)O· + Im-NO_2 $\rightleftarrows$ 2-(SO_3^-)-9,10-An(O)$_2$ + Im-NO_2·$^-$	9×10^6	8.4×10^8	7.0	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.5 mol L^{-1} t-BuOH or 0.2 mol L^{-1} 2-PrOH.	76WAR/CLA
126	9,10-Anthrasemiquinone-2-sulfonate anion + 5-Nitrouracil 2-(SO_3^-)-9,10-An(O^-)O· + Ur-NO_2 $\rightleftarrows$ 2-(SO_3^-)-9,10-An(O)$_2$ + Ur-NO_2·$^-$	4.1×10^6	1.3×10^9	7	p.r.	P.b.k. at 505 nm in deoxygenated soln. contg. 0.1–0.2 mol L^{-1} 2-PrOH.	75MEI/NET

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