XXIII. Dhofar 378

Basalt
15 grams

Introduction

Ikeda *et al*. (2002) reported another Martian meteorite (Dho 378) from Oman (found in an area near Dho 019). Dho 378 is somewhat similar to Dho 019, but has pyroxenes that are more Fe-rich and apparently lacks the Mg-rich olivine found in Dho 019 (Russell *et al*. 2002). Dreibus *et al*. (2002) find that Dho 378 is enriched in Na, Sr and feldspar compared with other shergottites.

Petrography

Dho 378 is reported to have "a doleritic or microgabbroic texture, and grain sizes of the main minerals about 1 mm" (Ikeda *et al*. 2002). It has a fresh black fusion crust and has been highly shocked (figure XXIII-1, not available). Abundant vesicles up to 1 mm are reported in recrystallized shock-melted glass (Mikouchi and McKay 2003).

Modal Mineralogy

	Ikeda *et al.* (2002)
Pyroxene	49 vol. %
Plagioclase (glass)	47
Opaques	3
Phosphates	1
Fayalite	tr.
Silica	tr.
Sulfide	tr.

Mineral Chemistry

Pyroxene: Subcalcic clinopyroxene is exsolved and chemically zoned (figure XXIII-2). The Fe/(Mg+Fe) ratio varies from 0.4 to 0.9, and both Fe-rich hedenbergite and pyroxferroite are present.

Plagioclase: Plagioclase (An_{33-53}) has been shock-melted to glass, which has re-crystallized at the rims.

Opaques: Titanomagnetite includes ilmenite lamellae.

Phosphates: Both whitlockite and minor apatite are reported.

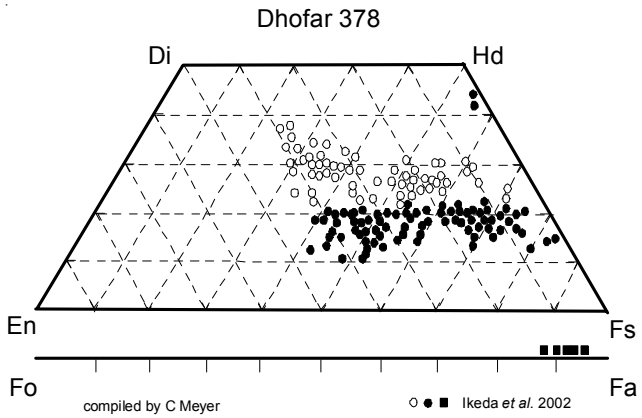

Figure XXIII-2: *Pyroxene and olivine composition diagram for Dhofar 378 (replotted from Ikeda et al. 2002).*

Whole-rock Composition

Dreibus *et al*. (2002) report an analysis of Dho 378 (table XXIII-1). They explain a slight positive Eu anomaly as due to high plagioclase/whitlockite ratio in the small split they analyzed (figure XXIII-3). They note that Dho 378 is "weakly contaminated with

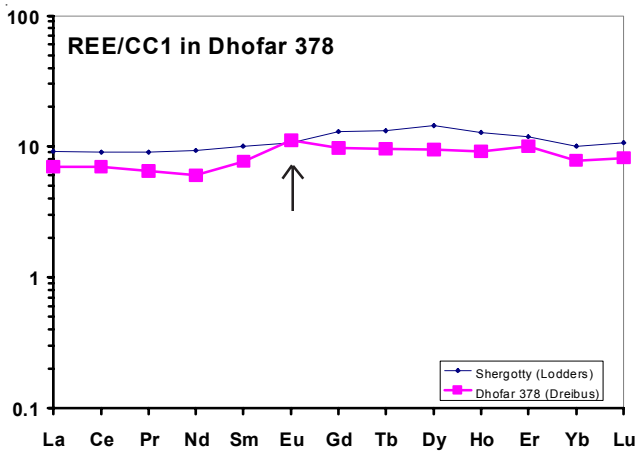

Figure XXIII-3*: Rare earth element diagram for Dhofar 378 compared with Shergotty (data from Dreibus et al. 2002 and Lodders 1998).*

terrestrial U and K", as is the case for all Martian meteorites collected from "hot desert" sites.

Other Isotopes

The oxygen isotope composition, determined by Mayeda and Clayton and reported by Ikeda *et al.* (2002), is $\delta^{18}O = +4.46$ ‰ and $\delta^{17}O = +2.52$ ‰, indicating that this meteorite is of Martian origin.

Table XXIII-1: Composition Dhofar 378

reference	Dreibus 2002		Ikeda 2002	
weight			fusion crust	
SiO2 %			48.08	(b)
TiO2			1.18	(b)
Al2O3			9.5	(b)
FeO	15.65	(a)	21.11	(b)
MnO	0.38	(a)	0.55	(b)
CaO	10.46	(a)	9.76	(b)
MgO			5.35	(b)
Na2O	2.6	(a)	2.31	(b)
K2O	0.2	(a)	0.15	(b)
P2O5			0.9	(b)
sum			98.89	
Sc ppm	43.7	(a)		
V				
Cr	260	(a)		
Co	29.3	(a)		
Ni	<40	(a)		
Cu				
Zn	77	(a)		
Ga	23.6	(a)		
Br	0.89	(a)		
Rb				
Sr	*120*	(a)		
Cs	0.4	(a)		
Ba	33	(a)		
La	1.64	(a)		
Ce	4.17	(a)		
Pr				
Nd	2.7	(a)		
Sm	1.13	(a)		
Eu	0.627	(a)		
Gd	1.9	(a)		
Tb	0.35	(a)		
Dy	2.3	(a)		
Ho	0.51	(a)		
Er				
Tm				
Yb	1.27	(a)		
Lu	0.2	(a)		
Hf	1.49	(a)		
Ta	0.14	(a)		
Ir ppb	<6	(a)		
Au ppb	7.7	(a)		
Tl ppb				
Bi ppb				
Th ppm	0.3	(a)		
U ppm	0.1	(a)		

technique: (a) INAA; (b) elec. probe