Adsorption Studies of Activity Loaded Aerosol

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In the He/KCl aerosol gas-jet transport technique, products of nuclear reactions recoil out of a thin target and are stopped in He containing KCl aerosols. The activities become attached to the aerosol particles and are then sucked through a capillary to a remote collection site kept at near vacuum, providing a fast and efficient transport of short-lived reaction products. At the collection site, after an appropriate collection interval, difficulties in dissolving and transferring the activity loaded aerosol have been observed[1]. The dissolution of the aerosol, on which the activity to be analyzed is attached, is one of the critical steps for achieving a high yield in irradiation experiments.

For this experiment a $^{32}S^{9+}$ beam (110 MeV, 60 enA) on a natural Ni-target was used. Easily detectable γ-active isotopes of Mo, Nb, and Zr were produced in xpxn-, xαxn- and αxpxn-reactions. The reaction products were transported by the He-jet system to the collection site where the aerosols were collected under vacuum on discs of different materials (PTFE (Teflon), PE (polyethylene), Ti and Pt) for a certain time interval. As in our single-atom chemistry experiments, the aerosols were removed from the disc with 50 µL of acid solutions (HCl, HBr, HF, HNO_3, α-HIB, HBr/HF or HCl/HF), and transferred to a centrifuge cone. For this test, both the aerosol/activity containing solution in the centrifuge cone and the disc, on which the aerosol was collected, were analyzed with a standard γ-ray spectroscopy system.

The results for ^{88}Mo, shown in the figure, indicate that titanium has the lowest desorption yield, leading to low chemical efficiencies. Platinum and PTFE seem to give relative high desorption yields. Another noteworthy effect was seen in the experiments with PE. With PE, the total activity collected was lower than for the other materials by a factor 5 to 10 and very low yields for removal of the activities were observed.

Footnotes and References

1. C.A.Laue et al., contribution to this report

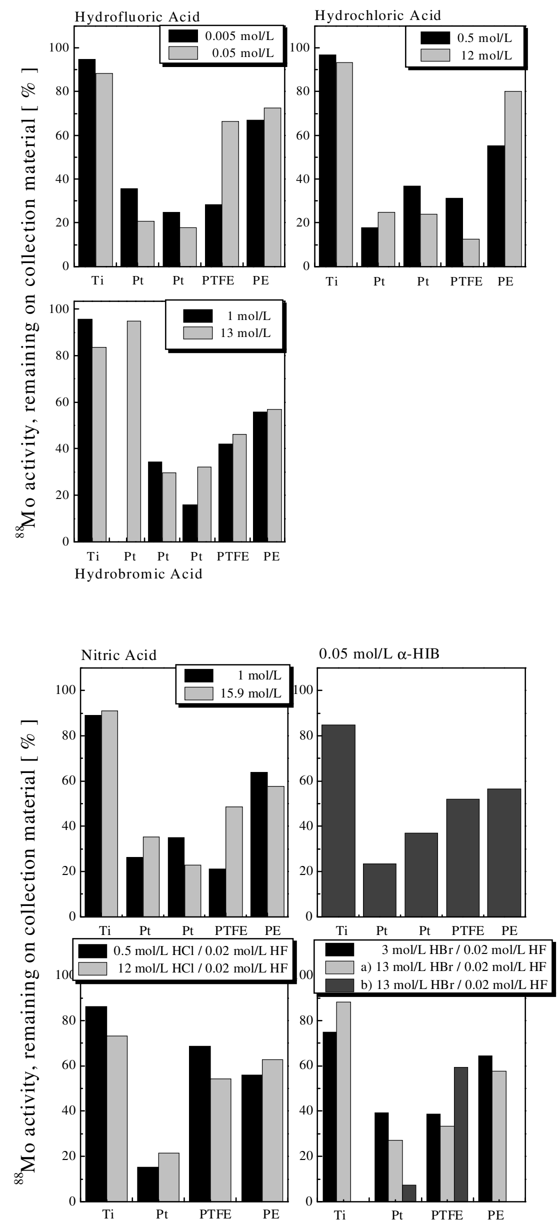

Fig. ^{88}Mo remaining on collection disc for various material and acid systems.