Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.23630

Effects of Saharan Weathering on Highly Siderophile Elements in Ordinary Chondrites

KIRAN S ALMAS, RICHARD D ASH AND RICHARD J. WALKER

University of Maryland

Presenting Author: kialmas96@gmail.com

Terrestrial alteration of meteorites is a prevalent issue as an increasing number of samples studied to decipher cosmochemical processes are found in hot desert environments. Desert finds may have terrestrial residence times of tens of thousands of years, allowing ample time for late-stage, open-system modification. The elemental and isotopic characteristics of meteorites may be affected by terrestrial alteration through the addition or removal of elements, or through redistribution within the meteorite. Evidence of terrestrial alteration has been well documented in studies of lithophile elements, but little work has been conducted to understand how highly siderophile elements (HSEs) might be affected. To this end, we have conducted leaching experiments on three high metamorphic grade (L6) chondrites, ranging from a fresh fall to a highly weathered specimen. These specimens were separately leached with water and acetic acid for periods ranging from six minutes to a week. The HSE abundances and Re-Os isotopic systematics of leachates and residues, as compared with initial bulk compositions, were examined. We found that the most weathered sample studied (NWA 14239) displays greater homogeneity in bulk HSE concentrations than the less weathered samples (Viñales and NWA 869), and released lower quantities of HSEs during leaching. Short term leachates of the less weathered samples yielded low $^{187}Os/^{188}Os$ ratios, indicating removal of low Re/Os phases that formed in the early solar system. These phases were evidently no longer present in the most weathered sample. The $^{187}Re/^{188}Os$ and $^{187}Os/^{188}Os$ ratios for leachates and residues definitively show that the Re-Os isotopic systematics are prone to open-system behavior when exposed to neutral to mild acidic precipitation. Comparative water and acetic acid leaches of NWA 869 indicate that, not surprisingly, leaching with water has a minimal effect on HSEs compared to a mild acid. Palladium was shown to be resistant to both water and acetic acid leaching, indicating that of the HSEs it may be less subject to late-stage open-system behavior. Attempts to mitigate the effects of weathering by acid washing may result in further loss of meteoritic material.