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WEATHERING OF LEAD IN FORT IRWIN FIRING RANGE SOILS

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EXTENDED ABSTRACT

This paper investigates the physical and chemical transformation of metallic lead (Pb) in Ft. Irwin firing range soils. Soil samples were collected from berms of two small arms firing ranges, an active one and an abandoned one, located in the Mojave desert. Pb bullet fragments found in field samples were analyzed by means of X-ray diffraction (XRD) and scanning electron microscopy (SEM) in order to determine the mechanism of metal breakdown in desert climates. Moreover, in order to further elucidate metallic Pb surface reactions, the process by which Pb fragments are subjected to field weathering conditions was simulated in the laboratory by performing wetting and drying cycle tests on the surface of metallic Pb specimens. Results indicated that metallic Pb bullet fragments recovered from the active range field samples were primarily covered by surface layers of cerussite and hydrocerussite, but litharge was also identified. In the abandoned range, hydrocerussite and metallic Pb were the predominant Pb species, but laurionite was also identified. The wetting and drying test results also confirmed the predominant presence of cerussite and hydrocerussite. Overall, it seems that in these high pH desert environments, Pb would eventually form insoluble secondary minerals and therefore, its mobility is expected to be quite limited.

Key words: firing ranges, bullet, weathering, cerussite, hydrocerussite, laurionite, plumbonacrite, XRD, SEM, FTIR.