The McDermitt Deposit (Oregon, US): Preliminary Results from a Li-Clay Volcano-Sedimentary System

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The McDermitt Caldera (western US) is host to one of the world's largest Li-clay resources, including the Thacker Pass (Nevada) and McDermitt (Oregon) deposits. The McDermitt project (Jindalee) holds indicated and inferred resources of 3 billion tonnes at 1,340 ppm Li, making it the largest lithium deposit in the US. In this contribution, we report on preliminary findings dealing with the geology, lithogeochemistry, and ore mineralogy of the system. The Li-clay resource sits in extensional sub-basins formed during caldera collapse caused by eruption of the McDermitt tuff. Post-collapse resurgence of the caldera created the geomorphology for the development of hydrologically closed lakes. Volcanic glass-rich air falls are common across the orebody, while welded tuffs occur at the bottom of a former lake system. High Li concentrations are found in the clay-rich beds, in association with geochemical anomalies indicating that smectite formed under low Eh conditions. Post-formation processes that altered the initial nature of the system include (1) uppermost oxidation-bleaching producing a deposit-scale V-Zn-Fe anomaly; and (2) late volcanism producing silicification and Mo-Sb-S anomalies in the basal mineralised section. The breakdown of volcanic glass is the main trigger of the formation of ±Li-rich smectites. The main Li-smectite formation events were disrupted by the authigenesis of zeolites and K-feldspar. This paragenesis is consistent with the pH increase occurring at the latest stages of closed hydrologic system diagenesis as observed in other alkaline lakes worldwide. The preliminary study of the clays indicates that whilst these are described as "hectoritic ores," the smectite assemblage includes other mineral species (e.g., saponite, ferrosaponite, etc.) not normally described as potential Li repositories. Based on these findings, future research efforts will be focused on understanding the relationship between hectorite and other clays to constrain the aging of smectites and thus the pathway of Li fixation in volcano-sedimentary systems.