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REMOVAL OF NICKEL AND ORGANIC CARBON IN THE PRESENCE OF PERCHLORATE IN SERPENTINE SOILS; IMPLICATIONS FOR MARTIAN REGOLITH

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Perchlorate (ClO_4^-) concentrations in the Martian surface (0.4 – 1 % ClO_4^-) are significantly higher compared to that on Earth. As perchlorate is a strong oxidizer, it may mobilize metals as well as remove organic compounds in the near-surface environment of Mars, which may be the reason for non-detection of organics from the Martian surface materials. Here we intend to assess perchlorate and regolith/soil interactions which may have occurred in the Martian surface using an ultramafic material that is analogous to olivine-rich rocks and serpentinites common on Mars. The purpose is to simulate and understand the fate of heavy metals and organics in Martian surface. Serpentine soil from Sri Lanka was used to simulate the fate on Mars since serpentine is found in both locations. Ni as the first metal to be investigated since serpentine is rich in Ni. Serpentine soils from Sri Lanka were reacted with three ClO_4^- concentrations (1, 0.75 and 0.5 (w/v)) to evaluate the release of Ni and Total Organic Carbon (TOC) at incremental time intervals up to 11 days. Nickel release rates are high in all soils >1.10±0.05 mg kg^{-1} hr^{-1} with the highest release being 2.67±0.02 mg kg^{-1} hr^{-1} in 1 w/v perchlorate. These rates indicate that high concentrations of mobilized metals such as Ni may pose a problem related to soil fertility. In 11 days, >50 wt. % of the TOC is removed in all of the soils, even in experiments with the lowest perchlorate loading. The mechanisms, nature and long-term kinetics of TOC removal are currently being developed; however, these initial findings indicate that removal of organics is fast with the potential of 'erasing' biosignatures in the Martian surface in the span of years. Overall, this study illustrates how perchlorate may present additional challenges to current Martian life studies and the future human habitation of Mars.