WATER-ROCK INTERACTIONS ON MARS: PRODUCTION OF VALUABLE RESOURCES

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Several research groups have been investigating the various resources available on Mars and how those resources can support long-term human exploration. Applying water to dry Martian regolith can produce hydrogen gas (H_2) and dissolved ions such as perchlorate (ClO_4^-), iron (Fe^{2+}), and magnesium (Mg^{2+}). Perchlorate can be used to make rocket propellant, and to create breathable oxygen for humans. Hydrogen can also be used as a propellant and to create water. Additionally, hydrogen can be used in the production of ammonia (NH_3) for plant fertilization or as another component of rocket propellant. Iron and magnesium are essential nutrients and are critical for producing quality fertilizers to support a sustainable food source. The University of Central Florida has developed a mineralogical standard for basaltic soils on Mars, based on quantitative mineralogy from the Mars Science Laboratory (MSL) Curiosity rover, called Mars Global Simulant (MGS-1). MGS-1 is one of the simulants serving as our Martian analog material and is being used to conduct anoxic water-rock experiments to measure the release of these potential resources from a Mars-like soil. Gas chromatography is being used to detect and quantify hydrogen, ion chromatography to measure perchlorate, and atomic absorption spectrophotometry to measure the release of iron and magnesium. Quantifying and better understanding the release of potential in-situ resources can bring the long-term human exploration of Mars closer to reality.