On-going laboratory efforts to quantitatively address clay abundance on Mars

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Data obtained at visible and near-infrared wavelengths by OMEGA on MarsExpress and CRISM on MRO provide definitive evidence for the presence of phyllosilicates and other hydrated phases on Mars. A diverse range of both Fe/Mg-OH and Al-OH-bearing phyllosilicates were identified including the smectites, nontronite, saponite, and montmorillonite. In order to constrain the abundances of these phyllosilicates spectral analyses of mixtures are needed.

We report on our on-going effort to enable the quantitative evaluation of the abundance of hydrated-hydroxylated silicates when they are contained in mixtures. We include two component mixtures of hydrated/hydroxylated silicates with each other and with two analogs for other martian materials; pyroxene (enstatite) and palagonitic soil (an alteration product of basaltic glass). For the hydrated-hydroxylated silicates we include saponite and montmorillonite (Mg- and Al- rich smectites). We prepared three size separates of each end-member for study: 20-45, 63-90, and 125-150 µm.

As the second phase of our effort we used scanning electron microscopy imaging and x-ray diffraction to characterize the grain size distribution, and structural nature, respectively, of the mixtures. Visible and near-infrared reflectance spectra of the 63-90 µm grain size of the mixture samples are shown in Figure 1. We discuss the results of our measurements of these mixtures.