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TITLE: The XRD Amorphous Component in John Klein Drill Fines at Yellowknife Bay, Gale Crater, Mars

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ABSTRACT BODY: Drill fines of mudstone (targets John Klein and Cumberland) from the Sheepbed unit at Yel-lowknife Bay were analyzed by MSL payload elements including the Chemistry and Mineralogy (CheMin), APXS (Alpha Particle X-Ray Spectrometer), and Sample Analysis at Mars (SAM) instruments. CheMin XRD results show a variety of crystalline phases including feldspar, pyrox-ene, olivine, oxides, oxyhydroxides, sulfates, sulfides, a tri-octahedral smectite, and XRD amorphous material. The drill fines are distinctly different from corresponding analyses of the global soil (target Rocknest) in that the mudstone samples contained detectable phyllosilicate. Here we focus on John Klein and combine CheMin and APXS data to calculate the chemical composition and concentration of the amorphous component.

The chemical composition of the amorphous plus smectite component for John Klein was cal-culated by subtracting the abundance-weighted chemical composition of the individual XRD crystalline components from the bulk composition of John Kline as measured by APXS. The chemical composition of individual crystalline components was determined either by stoichiome-try (e.g., hematite and magnetite) or from their unit cell parameters (e.g., feldspar, olivine, and pyroxene). The chemical composition of the amorphous + smectite component (~71 wt.% of bulk sample) and bulk chemical compositon are similar. In order to calculate the chemical composition of the amorphous component, a chemical composition for the tri-octahedral smectite must be assumed. We selected two tri-octahedral smectites with very different MgO/(FeO + Fe2O3) ratios (34 and 1.3 for SapCa1 and Griffithite, respectively). Relative to bulk sample, the concentration of amorphous and smectite components are 40 and 29 wt.% for SapCa1 and 33 and 36 wt.% for Griffithite. The amount of smectite was calculated by requiring the MgO concentration to be~0 wt.% in the amporphous component. Griffithite is the preferred smectite because the position of its 02l diffraction peak is similar to that reported for John Klein. In both cases, the amorphous component has low SiO2 and MgO and high FeO + Fe2O3, P2O5, and SO3 concentrations relative to bulk sample. The chemical composition of the bulk drill fines and XRD crystalline, smectite, and amorphous components implies alteration of an initially basaltic material under near neutral conditions (not acid sulfate), with the sulfate incorporated later as

veins of $CaSO_4$ injected into the mudstone.

KEYWORDS: 5470 PLANETARY SCIENCES: SOLID SURFACE PLANETS Surface materials and properties, 5410 PLANETARY SCIENCES: SOLID SURFACE PLANETS Composition, 5415 PLANETARY SCIENCES: SOLID SURFACE PLANETS Erosion and weathering.

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