SULFUR SPECIATION IN THE MARTIAN REGOLITH COMPONENT IN SHERGOTTITE GLASSES. M. N. Rao[1] , L. E. Nyquist[2], S. Sutton[3], and J. Huth[4]. [1]Jacobs-ESCG, Johnson Space Center, Houston. TX. E-mail: nageswara.rao @nasa.gov. [2]ARES,NASA,Johnson Space Center, Houston. TX. [3]Department of Geological Sciences, University of Chicago, Chicago.IL. [4]Max-Planck-Institute fuer Chemie, Saarstrasse 23, Mainz. Germany.

Introduction: We have shown that Gas-Rich Impact-Melt (GRIM) glasses in Shergotty, Zagami, and EET79001 (Lith A and Lith B) contain Martian regolith components that were molten during impact and quenched into glasses in voids of host rock materials based on neutron-capture isotopes, i.e., ^{150}Sm excesses and ^{149}Sm deficits in Sm, and ^{80}Kr excesses produced from Br [1, 2]. These GRIM glasses are rich in S-bearing secondary minerals [3.4]. Evidence for the occurrence of $CaSO_4$ and S-rich aluminosilicates in these glasses is provided by CaO-SO_3 and Al_2O_3 – SO_3 correlations, which are consistent with the finding of gypsum laths protruding from the molten glass in EET79001 (Lith A) [5]. However, in the case of GRIM glasses from EET79001 (Lith B), Shergotty and Zagami, we find a different set of secondary minerals that show a FeO-SO_3 correlation (but no MgO-SO_3 correlation), instead of CaO-SO_3 and Al_2O_3-SO_3 correlations observed in Lith A. These results might indicate different fluid-rock interactions near the shergottite source region on Mars. The speciation of sulfur in these salt assemblages was earlier studied by us using XANES techniques [6], where we found that Lith B predominantly contains Fe-sulfide globules (with some sulfate). On the other hand, Lith A showed predominantly Ca-sulfite/sulfate with some FeS. Furthermore, we found Fe to be present as Fe^{2+} indicating little oxidation, if any, in these glasses.

To examine the sulfide-sulfate association in these glasses, we studied their Fe /Ni ratios with a view to find diagnostic clues for the source fluid. The Fe-sulfide mineral ($Fe_{0.93}Ni_{0.3}S$) in EET79001, Lith A is pyrrhotite [7, 8]. It yields an Fe/Ni ratio of 31. In Shergotty, pyrrhotite occurs with a molar ratio of Fe:S of 0.94 and a Ni abundance of 0.12% yielding a Fe/Ni ratio of ~500 [8]. In this study, we determined a NiO content of ~0.1% and FeO/NiO ratio of ~420 in S-rich globules in #507 (EET79001, Lith B) sample using FE-SEM. In the same sample (bulk), using EMPA, we determined a FeO/NiO ratio of ~700 (raster mode). Using similar techniques, we determined a NiO content of ~0.015% and a FeO/NiO ratio of ~800 in #506 (EET79001, Lith A). Moreover, a NiO content of ~150 ppm and 6.1% FeO were found in Lith A GRIM glasses using neutron activation analysis [9] yielding a FeO/NiO ratio of ~420. The FeO/NiO ratios in secondary mineral phases in S-rich pockets of EET79001 (Lith A/B) and Shergotty are high (~400) compared to the FeO/NiO ratio of 31 in Lith A pyrrhotite. These results suggest similar kind of fluids interacted with different rock materials to yield the observed variations in GRIM glasses in EET79001 Lith A and B.

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