PREFERRED ORIENTATION RELATIONSHIPS OF OLIVINE AND PYROXENE IN THE SHERGOTTITE MARTIAN METERORITES

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Introduction: The geology and mineralogy of the Martian surface is characterised using remote sensing techniques alongside the analysis of Martian meteorites [1]. Thermal emission spectroscopy from instruments on a number of spacecraft is one method that has produced several maps of the surface mineralogy of Mars [2,3,4]. The interpretation of this mineralogy uses a spectral library of mostly terrestrial minerals to deconvolve whole rock spectra of the surface of Mars. We recently demonstrated that the spectra of Martian-specific minerals can be determined by using micro-spectroscopy [5,6]. These studies showed that useful spectra can be obtained from thin sections of Martian meteorites. One caveat is that the spectra of minerals in thin section can be highly dependent on crystal orientation. Furthermore, several references have been made to a potential preferred orientation of grains within some of these meteorites [7,8]. This investigation aims to ascertain if there is any preferred orientation of olivine and pyroxene grains within Martian meteorites Zagami, EETA79001, DaG 476 and SAU 005 by means of electron backscatter diffraction (EBSD).

Samples & Analytical Techniques: 4 thin sections were prepared for EBSD analysis from the meteorite collection at the Natural History Museum, (NHM), London; Zagami (BM1966, 54), EETA79001, DaG 476 (BM2000, M7) and SAU 005 (BM2000, M40). Thin sections were polished with colloidal silica and carbon coated prior to analyses. The Philips XL30 analytical scanning electron microscope in the Department of Earth and Ocean Sciences at the University of Liverpool was used for both EBSD and EDS analyses of the meteorites.

Preliminary Results & Discussion: Initial EBSD results for Zagami and SAU 005 indicate that both pyroxene and olivine can be distinguished from each other and indicate the potential for a preferred orientation of grains. Refinements are still required to distinguish augite from pigeonite within the method in order to allow possible different preferred orientations between the two pyroxenes to be determined. One area of concern to the analysis of Martian meteorites on the whole is that the presence of maskelynite and silicate glasses commonly found in Martian meteorites cannot be quantified using EBSD analysis.

Further Work: Detailed analyses of the 4 thin sections will be completed at the University of Liverpool and full results will be presented at the conference.

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