

CHARACTERIZATION OF THE LITHOLOGICAL CONTACT IN THE SHERGOTTITE EETA79001.

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Introduction: EETA79001 consists of two shergottite lithologies bound by a macroscopically distinct contact. Lithology A is an olivine-phyric shergottite and Lithology B is a basaltic shergottite. The petrogenesis of these lithologies have been ascribed to igneous and/or impact processes [1,2]. No systematic study has been conducted on the nature of the contact however, in order to determine the relationship between the two lithologies. Here we present current data on phase changes across the contact that might aid our understanding of the petrogenesis of this meteorite, and we discuss implications for a physical volcanological setting on Mars.

Digital Modal Analysis: Thin sections containing the contact were mapped with the electron microprobe, and x-ray maps were stacked and mosaicked in order to digitally identify phases and determine modes according to the techniques indicated in [3]. The technique allows us to identify distinct pyroxene phases that could not practically be distinguished with the petrographic microscope. Modes were determined in small increments across the contact and indicate that maskelynite gradually decreases across the contact, from Lithology B into Lithology A. Total pigeonite to maskelynite ratio increases in a fairly systematic fashion from Lithology B (1.5) into Lithology A (3.1).

Crystal Size Distribution Functions (CSD's): CSD's have been applied to EETA79001 in an attempt to elucidate the crystallization history of Martian melts [4], although it has not been applied across the contact. Despite the effective identification of different pyroxenes, we find several problematic geometric factors preventing application of this technique with confidence to the pyroxenes and maskelynite, and therefore do not apply it.

Pigeonite Core Anomalies: Chemical profiles performed by electron microprobe analysis reveal that some pyroxenes in Lithology B display complex zoning patterns that resemble those observed in QUE94201 [5]. In these pyroxenes, pigeonites have cores with reversely zoned Low-Mg anomalies – a feature that has thus far not been observed.

Conclusions: We contend that the contact in EETA79001 holds valuable information regarding the petrogenesis of the two shergottite lithologies, and provides unique insights into volcanic flow dynamics on Mars. Although no reliable information is thought to be extractable from CSD's, modal analysis indicates some gradation across the contact. Ratios of pyroxene to maskelynite indicate an increase from one lithology into the other. Low-Mg anomalies are manifested in the cores of pigeonite phenocrysts in Lithology B, perhaps indicating that they do not represent a simple single-stage crystallizing melt.

References:

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