IS THE SHERGOTTITE EETA 79001 A BRECCIA?

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In order to carry out precise and meaningful isotopic and geochemical analyses on the shergottite EETA79001, it is first necessary to undertake a careful petrographic and microprobe study. This abstract describes petrographic observations that have important implications for the analytical procedure and the final interpretation of the data. In addition, a new chemical procedure, which is described below, makes it possible to obtain results for different isotopic systematics on the same sample.

The petrographic results are similar to previous investigations (McSween and Jarosewich GCA 47 pp. 1501-1513; Steel and Smith JGR 87 pp. A375-A384). Two new thin sections of EETA 79001 lithology A and B were obtained from LPI. Both sections were mapped with high contrast secondary electron microscopy. The same method was used previously for Shergotty and ALHA 77005. Both lithologies are fractured, which may have been caused by the shock metamorphism. Significant amounts of shock melt occur only in lithology A.

The contact of lithology A and B is reported to be planar in hand specimen, but it is not clearly visible in thin section. McSween and Jarosewich suggested that this might be a magmatic contact of two different flows, but they cannot rule out that this is a breccia contact of two fragments. The morphology of the contact is not conclusive either way. It is not a simple contact of two fragments in a breccia but on the other hand it also is not a simple contact of two magmatic flows. There is no contact metamorphism and no chilled margin visible. However there is a clear textural difference between lithology A and lithology B. Lithology B has a intersertal to partly ophitic texture of pyroxene and plagioclase (maskelynite) while lithology A has a heterogeneous texture. Lithology A consists of textural domains, which in some cases are terminated by a shock fracture but in other cases are not microscopically distinct, as in the contact of lithology A and B.

Figure 1) is a map of the whole thin section of lithology A showing textural domains marked by black lines. Strongly oriented plagioclase laths occur in areas (I), while in other areas (II) the plagioclase is xenomorphic and possibly deformed. The zoned pyroxenes in this area (II) have an irregular form and the iron rich zoning does not parallel the crystal boundaries. Area (III) is a zone of a xenolithic ultramafic assemblage (McSween and Jarosewich).

From these observations I propose that lithology A of EETA 79001 might be a cataclastic breccia. The reason that the texture does not resemble a simple breccia texture is not clear. Possibly EETA 79001 was a breccia on Mars prior to the shock event (maybe a tectonic breccia: it does not necessarily require a second shock event). The shock event welded the fragments and disturbed the contacts. Lithology B might represent a large basaltic fragment in this breccia. The isotopic data of Wooden et al. (LPS XIII abstr. pp. 879-880) seem to favor such an model.

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A new chemical procedure for the isotopic analysis of EETA 79001 has been developed. This new method allows Sr, Nd, and Pb isotopes from the same dissolution to be measured.

The sample is dissolved in Hf+HClO4 in a teflon pressure vessel. After complete dissolution the sample is dried down and redissolved in 2N HCl. After an OH- precipitation, by adding NH4 (pH 8), the sample is centrifuged. The alkalies remain in the liquid (K,Rb,Cs). The solid containing Sr,Nd,Sm,U,Th,Pb, is redissolved in HBr (0.5N) and loaded onto an anion resin (X8) column where Pb is separated. Then an ion exchange column (filled with cation resin WX8) separates U,Sr,REE,and Th. From the REE fraction Sm and Nd are separated by the conventional HDEHP technique. The other fractions are cleaned up by cleaning columns (similar to the technique Manhes, Tesis univ. Paris 1982). This chemical procedure was worked out using radioactive tracers to optimise the yield (>90%). The blank is in the range of 20pg (except for K). Two mixed isotopic tracer are used to spike the sample prior to dissolution.

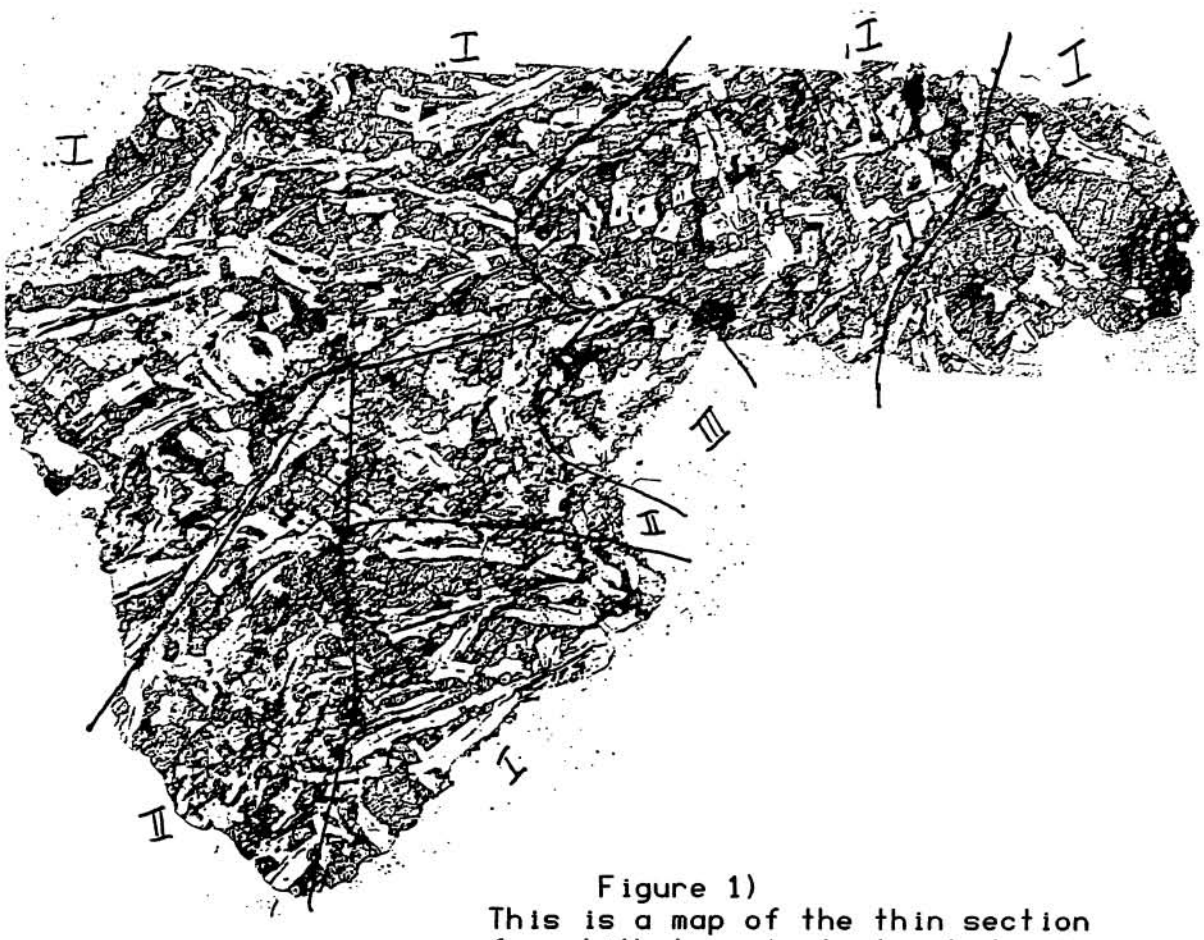

Figure 1)
This is a map of the thin section from lithology A; textural domains are marked by black lines.
plagioclase light grey;
pyroxenes dark grey