

Martian meteorite EETA79001, collected in Antarctica, is unique among basaltic shergottite specimens, because it contains two lithologies separated by a linear contact. Minerals present in Lithology A are pigeonite, maskelynite, augite, olivine, and orthopyroxene. Lithology A has smaller matrix grains (0.15 mm) than Lithology B. Lithology B is composed of pigeonite, maskelynite, and augite. The average matrix grain size is 0.3 mm. The two hypotheses previously posed for the observed contact are 1) Lithology A is an impact melt rock that incorporates Lithology B as a clast, or 2) the contact is a boundary between successive flows.

Pyroxene microstructures are commonly used to interpret magmatic, shock, and annealing processes. Quantitative EBSD orientation maps of pyroxene from Lithologies A and B reveal bands with misorientations of  $178 \pm 2^\circ$  about variable axes. Bands in A are well-defined, vary from 3-35  $\mu\text{m}$  wide, continue across fractures and melt, and extend to the grain boundaries. Bands in B are patchy, vary from 3-11  $\mu\text{m}$  wide, and rarely extend to the grain boundaries. Band presence and position do not correlate to compositional variations in pyroxene. Along with well-defined bands, Lithology A has a high percentage of glass that is reflected in a lower EBSD indexing percentage. In Lithology B, the patchy nature of the bands and their absence near the grain boundaries suggest partial annealing.

The observed bands do not appear to be exsolution lamellae, because they are much thicker than described pyroxene exsolution lamellae, they occur in a variety of crystallographic orientations, and they do not correspond with compositional differences. Crystallographic orientation maps and analysis of pole figures show that the bands are

seen as separate clusters on  $\langle 100 \rangle$ ,  $\langle 001 \rangle$ ,  $\{100\}$ , and  $\{001\}$  that rotate around  $\langle 010 \rangle$  and  $\{010\}$  in Lithology A. The separate clusters are  $38^\circ$  apart and lie on the same great circle that rotates around  $\langle 010 \rangle$  or  $\{010\}$ . In Lithology B, the bands are seen as dispersion of approximately  $38^\circ$  on  $\langle 100 \rangle$ ,  $\langle 001 \rangle$ ,  $\{100\}$ , and  $\{001\}$  that are distributed around  $\langle 010 \rangle$  and  $\{010\}$ . The dispersion on Lithology B suggests that the deformation was annealed or altered during ejection from the martian surface. The presence of low angle grain boundaries in Lithology B and high angle grain boundaries in Lithology A, suggests that B was similar to A and that the ejection from Mars' surface caused differentiation.