

A new occurrence of corundum in eucrite and its significance

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ABSTRACT

The diversity of lithologies is an important proxy of internal evolution in differentiated planets and asteroids. The major lithologies in Vesta, based on the howardite-eucrite-diogenite clan meteorites, include basalt, gabbro, noritic orthopyroxenite, orthopyroxenite, dunite, harzburgite, and dacite. No other lithology has been reported up to date. In this study, we report a new occurrence of corundum in eucrite meteorite Northwest Africa (NWA) 8647. Three-dimensional petrographic observations reveal that the corundum grain occurs as a mineral inclusion in a highly deformed pyroxene fragment. The texture indicates that the corundum is not a contaminant. The corundum-associated pyroxenes have Fe-Mn compositions consistent with typical pyroxenes from howardite-eucrite-diogenite meteorites. We suggest that the corundum grain could be a xenocryst incorporated during the ascent of a basaltic magma. The results might indicate the presence of an Al-rich, Si-poor region, probably lithology in the interior of Vesta, implying that the evolution and internal structure should be much more complex than previously thought.

Keywords: Corundum, Northwest Africa 8647, Al-rich lithology, eucrite, Vesta