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Focused ion beam milling: A method of site-specific sample extraction for microanalysis of Earth and planetary materials

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ABSTRACT

Argon ion milling is the conventional means by which mineral sections are thinned to electron transparency for transmission electron microscope (TEM) analysis, but this technique exhibits significant shortcomings. In particular, selective thinning and imaging of submicrometer inclusions during sample milling are highly problematic. We have achieved successful results using the focused ion beam (FIB) lift-out technique, which utilizes a 30 kV Ga^{+} ion beam to extract electron transparent specimens with nanometer scale precision. Using this procedure, we have prepared a number of Earth materials representing a range of structures and compositions for TEM analysis. We believe that FIB milling will create major new opportunities in the field of Earth and planetary materials microanalysis, particularly with respect to ultraprecious mineral and rock samples.