CALCULATING THE MODAL MINERALOGY OF AUBRITE METEORITES USING X-RAY COMPUTED TOMOGRAPHY

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The aubrites are a group of differentiated meteorites that formed in extremely reducing conditions, with oxygen fugacities (fO_2) ranging from ~2 to ~6 log units below the Iron-Wüstite buffer. At these extreme conditions, elements that are lithophile (silica-loving) on Earth can behave as chalcophiles (sulfur-loving) or siderophiles (metal-loving), and FeO-poor silicates and exotic sulfides can form. Elemental partitioning among minerals at these conditions are still not well understood, thus studying aubrites could help better constrain elemental behavior. Only 30 aubrites exist; however, they display various textures, which can be difficult to identify in small samples. Identifying composite clasts can help in understanding the igneous history of the aubrite parent bodies.

In order to distinguish different minerals and textures in larger samples, we use X-ray computed tomography (XCT), which is a useful, non-destructive analysis that can produce a 3D representation of a meteorite's textures, structures, and modal mineralogy. This study investigates the Norton County aubrite using XCT. Norton County is a fragmental impact breccia aubrite, and was an observed fall with a main mass of 1.1 tons. This large amount of material offers an opportunity to investigate a great volume of reduced, aubritic sample and study a more diverse variety of clasts. Here we report XCT results of two samples of Norton County (NC 15417) in order to constrain the 3D modal mineralogy of silicates, sulfides, and metals, and to identify unique clasts within the matrix.