American Mineralogist, Volume 90, pages ea1–ea17, 2005

ELECTRONIC ARTICLE

Getting the inside story: using computed X-ray tomography to study inclusion trails in garnet porphyroblasts

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ABSTRACT

This study demonstrates how high-resolution X-ray computed tomography can be used to determine the geometry of curved inclusion trails in garnet porphyroblasts. For the first time, the three-dimensional geometry of these features is shown as an animation, a stereo pair, a VRML model, and two-dimensional sections. The spatial resolution of the data in this study, approximately 10 μm, is high enough to resolve inclusions, and finer resolutions are possible. Comparisons of scan imagery with thin section and microprobe data demonstrate that many typical inclusion phases in garnet porphyroblasts can be clearly distinguished, including quartz, ilmenite, and monazite. A sodium metatungstate solution with a density of 1.19 g/cm^3 was used for a wedge calibration during scanning, reducing artifacts to a minimum and allowing maximum image contrast. The overall conclusion of this study is that high-resolution X-ray computed tomography is a quick, non-destructive technique that is invaluable in the study of porphyroblast microstructure. The three-dimensional data generated by this technique can be compared with geometries predicted by the varying theoretical models for the formation of curved inclusion trails in garnet porphyroblasts. They can also be analyzed to determine the three-dimensional orientation of curvature axes in individual porphyroblasts, which has not been possible until now.