Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.20452

Density of silicate melts by 3D X-Ray absorption microtomography

ALISHA CLARK[1], CHARLES LESHER[2], TONY YU[3] AND YANBIN WANG[4]

[1]University of Colorado Boulder
[2]Aarhus University
[3]University of Chicago
[4]The University of Chicago

Presenting Author: alisha.clark@colorado.edu

The density contrast between silicate liquids and their coexisting crystalline phases are fundamentally important to a variety of geologic processes including magmatic differentiation, melt migration and segregation, among others. Due to their lack of long-range order, determining density of liquids at high pressures is technically challenging. This is particularly true for multiphase systems, such as immiscible liquids or conditions within the melting interval where crystals and melt coexist. Here we present new developments in X-ray absorption microtomography using the rotating anvil apparatus (RAA) on the 13-BM-D GSECARS beamline at the Advance Photon Source, Argonne National Laboratory. Our Drickamer-style assembly has successfully been used to collect microtomography datasets up to 7 GPa and 2000K. X-ray absorption microtomography produces render volumes of voxel element attenuation that are related to sample density via the Beer-Lambert law. We demonstrate the utility of the method for providing data on both single and multiphase, natural and synthetic systems. Data presented for naturally occurring (USGS standard BCR-2) basalt at ambient conditions and at 3 GPa and 1600K are consistent with density for basalt measured by other methods. To illustrate the potential and versatility of the technique for *in situ* studies of high-pressure melt properties we will present density measurements for coexisting Fe (+/- S) phases, samples in complex geometries including those contained in metal and diamond capsules, and for basalt liquid from the supercooled liquid to liquidus temperatures.