

## **A moissanite cell apparatus for optical in situ observation of crystallizing melts at high temperature**

**FEDERICA SCHIAVI,<sup>1,\*</sup> NICOLAS WALTE,<sup>1</sup> ALEXANDER KONSCHAK,<sup>1,†</sup> AND HANS KEPPLER<sup>1</sup>**

<sup>1</sup>Bayerisches Geoinstitut, Universität Bayreuth, D-95440 Bayreuth, Germany

### **ABSTRACT**

An experimental apparatus is described that allows for optical in situ observation of samples at 1 bar and temperatures up to 1250 °C for durations up to several days. The apparatus resembles a Bassett-type externally heated diamond cell, where the diamond anvils are replaced by cylinders of synthetic moissanite (SiC). The sample is placed inside a gasket of glassy carbon between the two moissanite windows. The moissanite cell allows for the direct and continuous observation of the sample with an optical resolution in the range of a few micrometers. Partially molten systems can be investigated during cooling-heating cycles within a single experimental run. Texture evolution can be observed continuously through time. The technique also allows for direct measurements of crystal growth and dissolution rates at defined cooling and heating rates. The method was tested by observing the crystallization of KNO<sub>3</sub>-LiNO<sub>3</sub> and NaCl-KCl salt melts as well as of a basaltic-trachyandesitic melt. Dendrite formation, static grain growth, and dissolution were observed in the salt melts. During textural coarsening (static grain growth) of rock salt in the presence of melt, grain coalescence was observed. Both nitrate and rock salt grains growing in contact with melt generally showed curved boundaries and roundish shapes, rather than facets. In one experiment, the final texture did not contain any traces of the previous textural evolution anymore. In a basaltic trachyandesite at temperatures near the liquidus several phenomena, in particular the interactions between crystals, magmatic flow and bubbles during nucleation, growth and dissolution of crystals, and crystal-clusters were observed simultaneously. Crystal growth rates and dissolution rates were also measured.

**Keywords:** Moissanite, in situ experiment, rock textures, crystallization, static grain growth