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# Microstructural development in an Ammonium-based partial melt system

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**Abstract:** Microstructural development in a rock analog partial melt system is experimentally studied with the technique of synkinematic microscopy in which crystal-scale processes can be inferred after direct observation of microstructural changes. The aim of this work is to establish the link between microstructural changes and processes. Textural metamorphism such as dendrite segmentation, coarsening, and grain- or phase-boundary migration, is observed in the analog system even at supersolidus conditions. These processes may introduce complications when attempting to interpret the igneous textures since a great portion of textures in igneous rocks can be modified by textural metamorphism. During deformation experiments of the partial melt systems, microstructures indicating crystal plasticity and dynamic recrystallization are observed at faster strain rates (~10% per hour) and the resulting microstructures are similar to those formed at solid-state conditions. At slow strain rates (~1% per hour), a pressure solution-like process, contact melting, is active, resulting in optically strain-free crystals. Sliding along crystal boundaries is active in both regimes of strain rates. The observed microstructural development also introduces difficulties when interpreting deformation in igneous rocks; deformation microstructures indicating crystal plasticity can be formed at supersolidus and subsolidus conditions, and igneous rocks with optically strain-free crystals may have undergone large deformation by contact melting and sliding.

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