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オリビン拡散クリープ下での様々なLPOパターン発現
Development of olivine LPO under diffusion creep

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Lattice preferred orientation (LPO) of olivine is considered to be a main cause of anisotropic mantle especially of its elasticity, which can tell its dynamic state such as flow direction of the mantle. Olivine LPO is considered to be a consequence of dislocation creep process in the mantle so that intense investigations of the easy slip systems of the mineral under various geological conditions such as temperature, pressure and water fugacity have been conducted. Here we show that synthetic polycrystalline forsterite (+ Ca-bearing enstatite) aggregates demonstrate strong LPO after deformation under diffusion creep where large contribution of grain boundary sliding (GBS) to the sample strain. Combining the LPO patterns developed under tensile and compression tests, our observations correspond to A- and E-type fabrics, previously identified in experimental and natural samples, depending on temperature conditions without the effect of water and pressure on intragranular slip systems. Development of LPO under GBS creep strongly correlates the shape of grains which is crystallographically controlled. Such crystal shape provides grain boundary planes corresponding to crystallographic planes so that GBS and its consequence of grain rotation proceed at specific direction of the crystal resulting in an alignment of specific crystallographic axis to the flow direction forming LPO. Our finding adds new interpretations of the mechanism to form mantle anisotropy.

キーワード: オリビン, LPO, 拡散クリープ
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