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下部マントル最上部へ沈み込んだスラブ中で連結したフェロペリクレース
Interconnected ferro-periclase in the subducting slab at the top of lower mantle

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Major phase transformation occurs from ringwoodite to (Mg,Fe)SiO3 perovskite plus ferro-periclase when oceanic lithosphere sink into deep mantle across the 660 km discontinuity. After the transformation, material (rock) properties strongly depend on their two phase geometry, for example, grain-size, phase distribution, grain shape, lattice preferred orientation, and so on. The interconnection of ferro-periclase is a key factor on rheology and chemical heterogeneity because ferro-periclase is much weaker than (Mg,Fe)SiO3 perovskite and chemical diffusivity of ferro-periclase is higher than that of (Mg,Fe)SiO3 perovskite.

To investigate the interconnectivity of ferro-periclase after transformation from ringwoodite in the conditions of subducting slab, we carried out in-situ electrical conductivity measurement by means of high pressure experiment using a Kawai-type multianvil apparatus and 3D-textural observation on the recovered sample using FIB-SEM technique. The electrical conductivity of ferro-periclase is much higher than that of perovskite, suggesting that the conductivity of their aggregate is good indicator to estimate interconnectivity of ferro-periclase.

Our result suggested that the interconnected network of ferro-periclase was formed after phase transition from ringwoodite and remained for a while in the condition of cold subducting slab, leading that interconnected ferro-periclase plays important role on physicochemical properties of bulk rock. On the other hand, in the warm slab or regular mantle, ferro-periclase may be isolated in the aggregate. In this case, (Mg,Fe)SiO3 perovskite mainly controls the bulk properties.

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