# New constrains on the melt fraction in the oceanic upper mantle inferred from in-situ 3D conductivity measurements

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The electrical conductivity of partially molten KLB-1 peridotite during deformation in simple shear was measured at 1 GPa in a DIA type apparatus with a uniaxial deformation facility to evaluate origin of the conductivity anisotropy observed beneath the ocean floor. The conductivity measurements were performed simultaneously in two directions of three principal axes: parallel and normal to the shear direction on the shear plane, and perpendicular to the shear plane, by using impedance spectroscopy at temperature ranges of 1483-1548 K in a frequency range from 0.1 Hz to 1 MHz. Our results show that the melt fraction, the absolute conductivity values, and the degree of electrical anisotropy of partially molten KLB-1 peridotite systematically increase with temperature. Microstructural observations of the recovered samples suggest that the development of conductivity anisotropy was caused by the realignment of partial melt parallel to the shear direction. On the basis of the present and previous results, an unique layered model of partially molten asthenosphere comprising of horizontal melt-rich layers embedded in melt-poor mantle was proposed in this study. 1-3% of melt estimated from our horizontal layered model can well explain a sharp high-velocity contrast and high conductivity anomaly in the upper mantle.

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