

## Electrical conductivities of minerals and rocks in the Earth crust, upper mantle, mantle transition zone and subduction zone

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Magnetotelluric results have confirmed that there are many high conductivity anomalies in the deep Earth interior. To explain these available cases of high conductivity anomalies, we have undertaken in-situ measured electrical conductivities for a series of representative minerals and rocks occurring in the deep Earth by virtue of a multi-anvil press and a Solartron-1260 impedance spectroscopy analyzer (e.g. albite and granite in the deep Earth crust [1-2], olivine, pyroxene, garnet and peridotite in the upper mantle [3-10], wadsleyite in the mantle transition zone [11], and as well as eclogite, epidote, mudstone, gneiss and amphibole in the subduction zone [12-16]) at high-temperature and high-pressure conditions. Some crucial conclusions are summarized as follows: the pre-exponential factor of hydrogen-assisted electrical conductivity of Fe-bearing silicate minerals and rocks dependence on water content was determined as  $r = 0.6-1.0$ ; the main conduction mechanisms for anhydrous and hydrous Fe-bearing silicate minerals are small polaron and hydrogen-related defects, respectively; Geophysical observations for the high conductivity anomaly in the asthenosphere and mantle transition zone can be explained by a high water content or high electrical conductivity anisotropy; However, dry natural eclogite with different oxygen fugacities cannot explain the high conductivity anomaly in the region of the Dabie-Sulu ultrahigh-pressure metamorphic belt. Furthermore, the dehydration reaction and dehydrogenation effects of some representative hydrous minerals and rocks such as Fe-bearing epidote, Fe-bearing amphibole and mudstone can be used to reasonably explain the high conductivity anomaly in a subduction zone.

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