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高温高压下麻粒岩电导率研究

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The electrical conductivity of granulite at high temperature and high pressure

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摘要 麻粒岩是下地壳的重要组成物质,模拟其在下地壳温压条件下的电导率对于认识下地壳的电导率分布具有十分重要的意交流法在1 GPa下,373~1002 K范围内研究了麻粒岩样品的复阻抗,并且对测量结果进行了阻抗谱分析.研究结果表明,复阻有依赖性,且随温度的升高,复阻抗的实部、虚部均变小.在实验给出的温度范围内,电导率结果符合Arrhenius关系式.当温度 373~663 K范围内时,实验所获得的激化焓为0.31 eV,表明样品的电导率由低能带杂质离子所控制;当温度在673~1002 K 激化焓为0.67 eV,此时可能为小极化子导电.将所得电导率结果与西南峨边—马边地区以及华北应县—商河地区的大地电磁对比,发现在所模拟的下地壳温压范围内,实验室测得的电导率位于野外MT数据范围内.

关键词: 高温高压 麻粒岩 电导率 导电机制

Abstract: Granulite is one of the main components of the lower crust. Electrical conductivity of granuli the condition of lower crust is important to map the distribution of electrical conductivity in the lower cr impedance spectra of granulite were determined using alternating current at 1.0 GPa and 373~1002 K in study. The experimental results were also analyzed in terms of the impedance spectra. The results confi the complex impedance depends on the frequency of alternating current. The real and imaginary part of impedance decreased with increasing temperature. The experimental results also indicated that the elect conductivity shows the Arrhenius behavior perfectly in the given temperature range. The activation enth derived is 0.31 eV at temperatures of 373~663 K, which indicated that electrical conductivity is dominat impurity. In contrast, the activation enthalpy is 0.67 eV between 673 K and 1002 K corresponding to the conduction mechanism of electron-hopping between Fe^{2+} and Fe^{3+}. We compared experimental results models derived from the MT data of Ebian-Mabian region in southwestern China and Yingxian-Shanghe re northern China,and found that the electrical conductivity values obtained in this study are consistent wi data.

Keywords: High temperature and high pressure Granulite Electrical conductivity Conduction mecha

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