HEARD, H. C., Duba, A., Schock, R. N., and Stromberg, H. D., The electrical conductivity of polycrystalline olivine and pyroxene to 5.0 GPa, Eos Trans. AGU 56, 388 (1975). [UCRL-76621, Abstract]

The electrical conductivity (σ) of sintered natural olivine (Mt. Leura peridot) and pyroxene (Bamle enstatite) was measured to 5.0 GPa (50 kbar) and 1200°C in a girdle-anvil device. The olivine σ, measured at pressures between 2.0 and 5.0 GPa, is approximately one order of magnitude lower than single-crystal σ values at atmospheric pressure (unknown oxygen fugacity) and is a factor of 3 higher than the σ reported for olivine with similar composition from the Red Sea under controlled fugacity (10^{-2} Pa). Since the samples were sintered at 1200°C and 5.0 GPa in a tantalum capsule, these results are consistent with a reequilibration during the sintering process. The enstatite σ (between 2.0 and 5.0 GPa) is within a factor of 4 of that measured for polycrystalline and single-crystal Bamle enstatite at atmospheric pressure under controlled oxygen fugacity (10^{-2} Pa). Collectively these data are consistent (within 200°C) with high temperatures for the interior of terrestrial planets based on previously published single-crystal σ data under controlled oxygen fugacity. Furthermore, these results indicate that at these pressures and temperatures, the influence of grain boundaries is not significant. Both σ and activation energy (ΔH^*) show little pressure dependence; this agrees with previous work to 0.8 GPa. For example, between 2.0 and 5.0 GPa, ΔH^* for the enstatite varies from 1.01 to 1.06 eV.

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Diffusion coefficients of the system $ZnSO_4$-H_2O at 25°C have been measured by using Rayleigh optics from 0.004 to 3.33 m. The results appear to extrapolate with reasonable agreement to the data of Harned and Hudson at very low concentration. The diffusion coefficients decrease from 0.8486×10^{-5} at 0 m to 0.2813×10^{-5} $cm^2 \cdot sec^{-1}$ at 3.33 m. Densities were measured over the