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# Electrical conductivity of albite at high temperatures and high pressures

**Haiying Hu,[1,2] Heping Li,[1,*] Lidong Dai,[1] Shuangming Shan,[1] and Chengming Zhu[1]**

[1]Laboratory for Study of the Earth's Interior and Geofluids, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang, Guizhou 550002, China
[2]Graduate School of Chinese Academy of Sciences, Beijing 100039, China

## Abstract

The electrical conductivity of low albite has been measured using a complex impedance spectroscopic technique at 1.0–3.0 GPa and 773–1073 K in the frequency range of $10^{-1}$ to $10^{6}$ Hz in a YJ-3000t multi-anvil press. Within this frequency range, the complex impedance plane displays a semi-circular arc that represents a grain interior conduction mechanism. The electrical conductivity of albite increases with increasing temperature, and the relationship between electrical conductivity and temperature fits the Arrhenius formula. Pressure has a weak effect on the electrical conductivity of albite in the experimental pressure-temperature (*P*-*T*) range in the present work. The pre-exponential factors decrease, and the activation enthalpy increases slightly with increasing pressure. The activation energy and activation volume of albite are $0.82 \pm 0.04$ eV and $1.45 \pm 0.28$ $cm^3/mol$, respectively. Comparison with previous results with respect to albite indicates that our data are similar to previous data within the same temperature range. The dominant conduction mechanism in albite is suggested to be ionic conduction, where loosely bonded sodium cations, the dominant charge carriers, migrate into interstitial sites within the feldspar aluminosilicate framework. The Na diffusivity inferred from electrical conductivity of albite in this study using the Nernst-Einstein relation is consistent with that of previous studies on natural albite.

**Keywords:** Albite, high temperature and high pressure, electrical conductivity, conduction mechanism