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THE ELECTRICAL CONDUCTIVITY OF LOW AND HIGH ALBITE THROUGHOUT ITS MELTING INTERVAL AT 100 kPa

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The electrical conductivity (σ) of single-crystal Amelia albite has been measured parallel to the *b* axis under controlled oxygen fugacity near the QFM buffer up to 1406K. Two specimens were used in the investigation. One was held at temperatures between 1353 and 1384K for a total of 3200 hours in order to produce maximum-disordered monoclinic albite (Piwinskii & Duba 1974). These temperatures were below the reported melting point of albite, 1391K (Grieg & Barth 1938). The other sample, triclinic ordered albite, was cycled between 673 and 1223K, temperatures below the triclinic-monoclinic inversion (Duba & Piwinskii 1974).

The σ of high albite (monoclinic) during melting at 1406K as a function of time and frequency (ν) is shown in Figure 1. It is clear that the σ of high albite *increases* on melting by approximately half an order of magnitude at 1 to 10 kHz, but *decreases* at all ν's below 1 kHz during the first hundred hours.

The σ of low albite (triclinic) during melting at 1406K as a function of time and frequency is shown in Figure 2. The σ was found to *increase* at all ν's. The σ measured at 1 and 10 kHz increased by approximately 2.5 orders of magnitude, and the σ measured at 200 Hz increased by approximately two orders of magnitude.

These results indicate that the crystal structures of low and high albite preceding melting exert a control over both the ν-dependence of the σ obseved on melting and the magnitude and direction of the conductivity change. These new data further qualify the observation of Khitarov & Slutskii (1965) regarding the sharp increase (approximately two decades) in σ at-

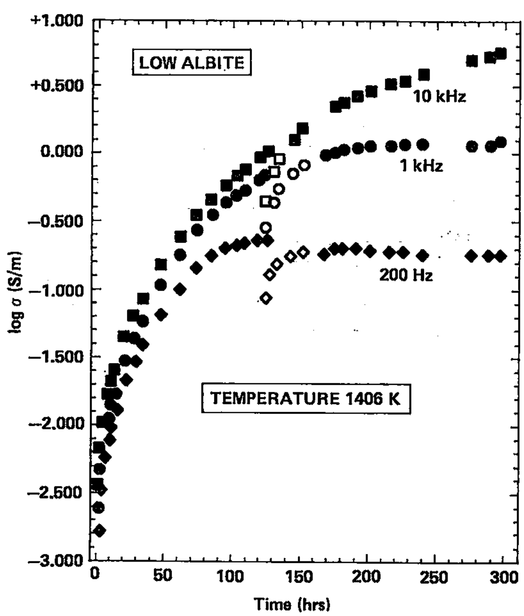

FIG. 1. The electrical conductivity (σ) of high albite as a function of time at 1406K.

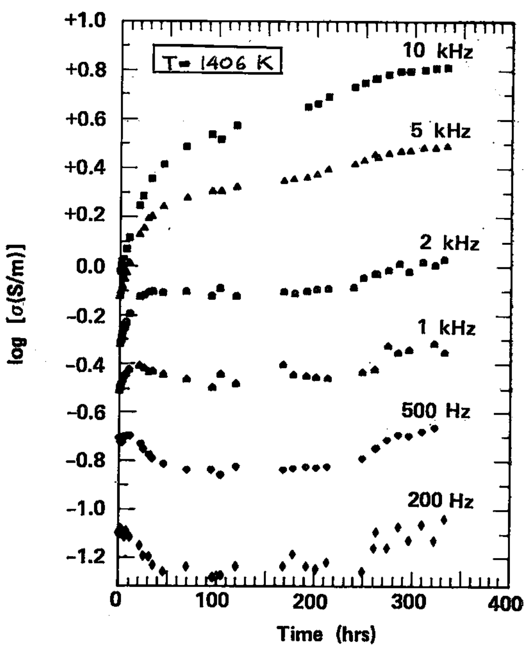

FIG. 2. The electrical conductivity (σ) of low albite as a function of time at 1406K.

tributed to melting in albite. In systems such as $NaAlSi_3O_8$ which exhibit order-disorder phenomena, the degree of disorder attained prior to melting may control the σ change upon melting. Thus, we may expect to observe such features, upon melting, in rocks such as basalt which contain plagioclase feldspar as a major constituent.

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REFERENCES

DUBA, A. & PIWINSKII, A. J. (1974): Electrical conductivity and the monoclinic-triclinic inversion in albite. *Trans. Amer. Geophys. Union, EOS* **56**, 1201.

GRIEG, J. & BARTH, T. F. W. (1938): The system $Na_2O \cdot Al_2O_3 \cdot 2SiO_2$ (nepheline carnegieite) — $Na_2O \cdot Al_2O_3 \cdot 6SiO_2$ (albite). *Amer. J. Sci.* **35A**, 5th Ser., 93-112.

KHITAROV, N. & SLUTSKII, A. (1965): Melting and crystallization of albite at pressures up to ten thousand atmospheres. *Geokhimiya*, No. 9, 1292-1299 (in Russ.).

PIWINSKII, A. J. & DUBA, A. (1974): High temperature electrical conductivity of albite. *Geophys. Res. Letters* **1**, 209-211.

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