

Methodological re-evaluation of the electrical conductivity of silicate melts

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ABSTRACT

Electrical impedance measurements in the laboratory on silicate melts are used to interpret magnetotelluric anomalies. On the basis of 2- and 4-electrode measurements, we show that the influence of the electrodes of the 2-electrode system on the measured resistivity can be of significant importance for low-resistivity melts and increases with temperature. At 1400 °C, the resistivity of very conductive melts measured with two electrodes can reach six times the resistivity value measured with four electrodes. A short-circuit experiment is needed to correct the 2-electrode data. Electrodes contribution is also estimated for samples from other studies, for which the resistance of the electrical cell can be as high as the resistance of the sample. A correction of the resistivity data from the literature is proposed and values of the corresponding Arrhenian parameters are recommended.

Keywords: Impedance measurements, resistivity, melts