

## E1-40: Electrical conductivity and dielectric studies of $\alpha$ -sialon ceramics

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The structure of  $\alpha$ -sialon suggests the possibility of fabricating sialon ceramics with high electrical conductivity by doping appropriate metal cations. This paper presents a study of the electrical conductivity and dielectric behaviour of some  $\alpha$ -sialons with different composition in the temperature range 25-1150°C. Pressureless sintered Ca, Y, Yb, Nd, Sm and Er  $\alpha$ -sialons with different  $\alpha$ - $\beta$  phase ratios were used for this investigation.

AC electrical conductivity and dielectric properties were studied by a complex impedance method using an impedance analyser. Two platinum plates were used as electrodes and platinum paste in-between the sample and the electrodes was used for better contacts. The arrangement was kept in a horizontal tube furnace using the sample holder and the measurements were taken in the temperature range 25-1150°C on heating and subsequent cooling. Transference numbers were determined using the DC. polarisation technique in the same temperature range. The complex impedance data was used to calculate the dielectric constant.

Lack of thermal hysteresis indicates that no compositional changes occurred during the measurements. The study shows that there is a significant dependence of conductivity and dielectric property of sialons on temperature and composition. Yb- $\alpha$ -sialon showed the highest conductivity ( $1 \times 10^{-3} \text{ S cm}^{-1}$  at 25°C and increased to  $1 \times 10^{-3} \text{ S cm}^{-1}$  at 1150°C) with the lowest activation energy (0.3eV) and slightly higher dielectric constant. All the other  $\alpha$ -sialons showed a similar behaviour, but lower conductivity and higher activation energy values. The polarisation tests further indicated the existence of a mixed ionic-electronic conduction in Yb-  $\alpha$ -sialon ceramics.

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