Electrical properties of fresnoite Ba$_2$TiSi$_2$O$_8$ using impedance spectroscopy

Abstract

Fresnoite with composition Ba$_2$TiSi$_2$O$_8$ (B$_2$TS$_2$) was first found in 1965, adopting a non-centrosymmetric structure. It also reported to crystallize in a tetragonal unit cell with a=8.52Å and c=5.210Å leading to some possible application as hydrophone, transducer and second harmonic generation and low temperature co-fired ceramics (LTCC). B$_2$TS$_2$ were synthesized by conventional solid state reaction. Phase-pure B$_2$TS$_2$was obtained after heating the pellets at a final sintering temperature of 1230 °C in air at 92 h. Study found that Fresnoite B$_2$TS$_2$ is a type of materials which are not ferroelectric and instead show perfect dielectric insulator behaviour with resistance >10$^6$Ωcm at temperatures below 750°C and also shows nonideal debye response. The activation energy for conduction of B$_2$TS$_2$ samples is very high, indicating that these materials are highly insulating.

Keywords

Ferroelectric; Fresnoite; Impedance spectroscopy and debye response