

Investigation of the phase formation and dielectric properties of Bi₇Ta₃O₁₈

ABSTRACT

Polycrystalline Bi₇Ta₃O₁₈ was synthesised at the firing temperature of 950 °C over 18 h via conventional solid state method. It crystallised in a monoclinic system with space group C₂/m, Z = 4 similar to that reported diffraction pattern in the Inorganic Crystal Structure Database (ICSD), 1-89-6647. The refined lattice parameters were a = 34.060 (3) Å, b = 7.618 (9) Å, c = 6.647 (6) Å with $\alpha = \beta = 90^\circ$ and $\gamma = 109.210 (7)$, respectively. The intermediate phase was predominantly in high-symmetry cubic structure below 800 °C and finally evolved into a low-symmetry monoclinic structured, Bi₇Ta₃O₁₈ at 950 °C. The sample contained grains of various shapes with different orientations in the size ranging from 0.33622.70 μm. The elemental analysis showed the sample had correct stoichiometry with negligible Bi₂O₃ loss. Bi₇Ta₃O₁₈ was thermally stable and it exhibited a relatively high relative permittivity, 241 and low dielectric loss, 0.004 at room temperature, ~30 °C and frequency of 1 MHz.

Keyword: Ceramics; Sintering; Powder diffraction; Dielectric properties