## Synthesis, structural and electrical properties of novel pyrochlores in the Bi2O3-CuO-Ta2O5 ternary system.

## **ABSTRACT**

series non-stoichiometric cubic pyrochlores with general Bi3-xCu1.8Ta3+xO13.8+x (BCT) was successfully prepared by solid state reaction at the firing temperature of 950 °C over 2 days. The solid solution mechanism is proposed as oneto-one replacement of Bi3+ for Ta5+, together with a variation in oxygen content in order to achieve electroneutrality. The solid solution limit is confirmed by X-ray diffraction technique (XRD) for which linear variation of lattice constants is observed at  $0 \le x \le 0.6$ . The refined lattice constants are found to be in the range of 10.4838 (8) Å-10.5184 (4) Å and the grain sizes of these samples determined by scanning electron microscopy (SEM) fall between 1 and 40 µm. Meanwhile, thermal analyses show no physical or chemical change for the prepared pyrochlores. The relative densities of the densified pellets for AC impedance measurements are above 85% and the measured relative permittivity,  $\varepsilon'$  and dielectric loss, tan  $\delta$  for composition, x = 0.2 at ambient temperature are  $\sim 60$  and 0.07 at 1 MHz, respectively. The calculated activation energies are 0.32-0.40 eV and the conductivity values, Y' are in the order of 10-3 at 400 °C. The conduction mechanisms of BCT pyrochlores are probably attributed to the oxygen non-stoichiometry and mixed valency of copper within the structure.

**Keyword:** Solid state reaction; X-ray methods; Electrical properties; Tantalates.