

# Abstract

**Sherif G Elsharkawy**

## **Thermal expansion measurements of (Cu<sub>0.25</sub>Tl<sub>0.75</sub>)-1234 added by MgO - nano particles**

The effect of nano-size MgO (40–60 nm) addition on both granular structure and volume thermal expansion measurements of polycrystalline (Cu<sub>0.25</sub>Tl<sub>0.75</sub>)-1234 was studied. The MgO-content  $x$  varied from 0.0 to 1.0 wt.% of the sample total mass. Granular investigation using scanning electron microscope revealed that both number and size of voids decreased as  $x$  increased from 0 wt.% to 0.6 wt.%. These results were supported by porosity calculation of the samples. The volume thermal expansion was calculated using X-ray powder diffraction from room temperature down to 80 K. The volume thermal expansion coefficient, at room temperature decreased, from  $9.3 \times 10^{-5} \text{ K}^{-1}$  to  $7.2 \times 10^{-5} \text{ K}^{-1}$  as MgO-concentration increased from 0.0 wt.% to 0.6 wt.% before it increased to  $8.9 \times 10^{-5} \text{ K}^{-1}$  for MgO-concentration = 1 wt.%. The Debye temperatures, calculated from the volume thermal expansion coefficient measurements, were reported as a function of MgO-concentration and superconducting transition temperature.