

## **Effect of heat treatment condition on the phase formation of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> superconductor**

### **ABSTRACT**

Polycrystalline samples with the nominal composition YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> (Y-123) were prepared using the co-precipitation method. The effect of the calcination process (single and multiple calcinations) on the samples was investigated by using the four-point temperature-resistance measurement, x-ray diffraction (XRD) and field-emission scanning electron microscope (FESEM). This study is divided into two parts. For the first part, the obtained oxalate powder underwent two calcination processes at 900 °C for 12 h and 900 °C for 24 h, respectively. Then, the powders were pressed into pellets and sintered at 920 °C for 15 h with oxygen flow during the entire heat treatment. In the second part, only one calcination process was undertaken at 900 °C for 24 h before the sintering process in oxygen flow at 920 °C for 15 h. From the XRD patterns, all of the peaks were indexed to the Y-123 phase showing that this superconducting phase was already formed after the first calcination. The volume fraction of Y-123 of the samples with single calcination process was higher compared to multiple calcination processes. From the temperature-resistance measurement, all the samples showed metallic behavior in the normal state and a superconducting transition to zero resistance. The superconducting transition temperature, T<sub>c</sub>, for the samples prepared in a single calcination process is higher than that of the multiple calcination processes.

**Keyword:** Co-precipitation; FESEM; Superconductivity; XRD; YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub>