

## Structural and superconducting properties of $Y(Ba_{1-x}K_x)_2Cu_3O_{7-\delta}$ ceramics

### ABSTRACT

$Y(Ba_{1-x}K_x)_2Cu_3O_{7-\delta}$  ceramics ( $x = 0.00, 0.03, 0.05$  and  $0.08$ ) were synthesized by thermal treatments of aqueous solution of metals nitrates and polyvinyl pyrrolidone (PVP) that acts as a capping agent. The effects of K-substitution on the crystal structure, microstructure and electrical resistance of samples were investigated. The X-ray diffractions results indicated an improvement of crystallinity and variation of lattice constant,  $a$ ,  $b$  and  $c$  of  $YBa_2Cu_3O_{7-\delta}$  (Y123) phase with K-substitution. The K-substitution resulted in increasing of orthorhombicity factor compared to pure Y123. Microstructural observation using scanning electron microscopy showed that K-substitution promotes the grain growth of Y123. The superconducting transitions ( $T_c$ ) of the substituted-samples were higher than that of the pure Y123. The  $T_c$  (onset) were 93, 97, 95, 95 K for the samples with  $x = 0.00, 0.03, 0.05$  and  $0.08$ , respectively. Comparing with pure sample, the substituted-samples showed sharper superconducting transition ( $\Delta T_c$ ). The best superconducting properties was observed for sample with  $x = 0.03$ .

**Keyword:** Thermal treatment; Crystallinity; Critical temperature; Microstructure; Superconducting transition

