

## Effect of Yttrium Doping on Properties of $\text{Bi}_2\text{Sr}_{1.9}\text{Ca}_{0.1-x}\text{Y}_x\text{Cu}_2\text{O}_{7+\delta}$ (Bi-2202) Cuprate Ceramics

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**Abstract :** In this work, we report the effect of  $\text{Y}^{3+}$  doping on structural, mechanical and electrical properties of Bi-2202 phase. Samples of  $\text{Bi}_2\text{Sr}_{1.9}\text{Ca}_{0.1-x}\text{Y}_x\text{Cu}_2\text{O}_{7+\delta}$  with  $x = 0, 0.025, 0.05, 0.075$  and  $0.1$  are elaborated in air by conventional solid state reaction and characterized by X-Ray Diffraction (XRD), Scanning Electronic Microscopy (SEM) combined with EDS spectroscopy, density, Vickers micro-hardness and resistivity measurements. A good correlation between the variations of the bulk density and the Vickers micro-hardness with doping is obtained. The SEM photograph shows that the samples are composed of grains with a flat shape that characterizes the Bi-based cuprates. Quantitative EDS analysis confirms the reduction of Ca content and the increase of Y content when  $x$  is increased. The variation of resistivity with temperature shows that only samples with  $x = 0, 0.025$  and  $0.05$  present an onset transition to the superconducting state. The higher onset transition temperature is obtained for  $x = 0.025$  and is about  $93.62$  K. The transition is wide and is realized in two steps confirming then the presence of the low  $T_c$  Bi-2201 phase in the samples. For  $x = 0.075$  and  $0.1$ , a transition to a semiconducting state is seen at low temperatures. Some physical parameters are extracted from these curves and discussed.

**Keywords :** Bi-2202 phase, doping, structure, mechanical and electrical properties

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