

Changes in doping state of (Tl, Pb)Sr1212 superconductors with Yb substitution at Sr site

Abstract

Samples with nominal starting compositions of $Tl_{1-0.5y}Pb_{0.5y}Sr_{2-y}Yb_yCaCu_2O_7$ ($y = 0-0.6$) were synthesized using conventional solid-state synthesis method. Temperature dependent electrical resistance measurements on the series showed that the normal state behavior and superconducting properties can be controlled by adjusting Yb concentration to achieve maximum critical temperature (T_c). The best superconducting behavior for the series was observed for $Tl_{0.5}Pb_{0.5}Sr_{1.8}Yb_{0.2}CaCu_2O_7$ with onset critical temperature ($T_{c\text{ onset}}$) of 105 K. Results of critical temperature (T_c) measurements, microstructure investigation using scanning electron microscope (SEM) and powder X-ray diffraction (XRD) analysis are presented. The effects of Yb substitutions are discussed in terms of T_c , Tl1212 phase formation and the concept of average Cu valence.

Keyword: Substitution effects, TlSr1212, Transition temperature