

Transport, Magnetic And Structural Properties Of(Tl_{0.5}Pb_{0.5})Sr₂-xCe_xCa₂Cu₃O_y Compounds

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Summary

Resistivity, DC magnetization and X-ray diffraction measurements were performed on 6 sample with nominal composition (Tl_{0.5}Pb_{0.5})Sr₂-xCe_xCa₂Cu₃ O_y, with x=0.0, 0.1, 0.2, 0.3, 0.4 and 0.5. As cerium content was increased, the transition temperature increased up to about 6 K when x=0.1. The phase diagram of the onset transition temperature versus Ce content reflects the expected behavior as the hole concentration in the Cu-O planes is expected to decrease with increasing x, passing from overdoped through optimally doped to an underdoped state for higher values of Ce⁴⁺ replacing Sr²⁺ atoms. Magnetization measurements at 4 K, in cyclic field 9 Tesla, on the other hand, showed that the critical current density of the samples decreased as Ce content was increased for all values x. It also showed the existence of the superconducting phase up to x=0.5, which was not detectable by resistivity measurements. X-ray diffraction measurements, indicate that Ce enters the structure of the Tl-1223 phase, and hence affect its superconducting properties as it changes the charge carrier concentration in the Cu-O planes

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