Effect of Mo Addition on the Superconducting Properties of Sintered $YBa_2Cu_3O_{7-y}$ Superconductors

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Doping studies have been attempted to understand the relationship between superconductivity and the crystal structure of $YBa_2Cu_3O_{7-x}$ (Y123) superconductors. Transition metals are used to substitute for Cu atoms and decrease a superconducting transition temperature (T_c) in samples prepared using powders by solid state reaction method. Meanwhile, metal doping sometimes increase the flux pinning potential of melt-processed samples without any significant degradation of T_c. The role of doping elements at melt state appears to be different from that at the solid state. In this study we investigated the effect of Mo addition on the phase formation and superconductivity of sintered Y123 superconductors. Mo powders with various compositions (0, 0.0025, 0.005, 0.0075, 0.01, 0.025, 0.050, 0.075, 0.1, 0.2 wt.%) were mixed with a Y123 powder by a ball milling technique using ZrO_2 balls and ethanol and then dried in a vacuum oven. The dried powder was pressed uniaxially in a steel mold into pellets. The pellets were sintered at 920^{o}C for 10 h in air and heat-treated in flowing oxygen for oxygen embedding in a Y123 phase. Microstructure was investigated by using an optical microscope and scanning electron microscope for the polished/etched surfaces of samples. Superconducting transition temperature and critical current density of samples were estimated from magnetization curves at 77 K obtained using a superconducting quantum interference device magnetometer. The superconducting properties of Mo doped Y123 samples are reported in terms of microstructure modification by Mo addition.

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