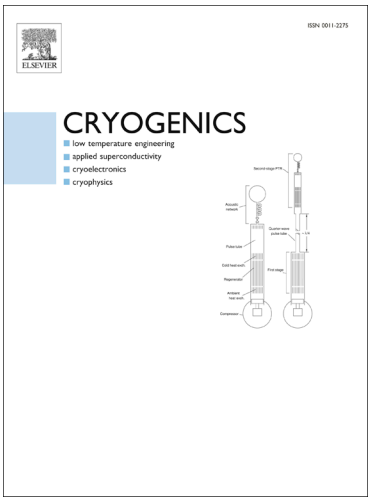


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# Magneto-Transport Properties of $(Cu)_x$/CuTl-1223 Nanoparticles-Superconductor Composites

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## Abstract

Copper (Cu) nanoparticles and $Cu_{0.5}Tl_{0.5}Ba_2Ca_2Cu_3O_{10-\delta}$ (CuTl-1223) superconducting phase were synthesized by sol-gel and solid-state reaction, respectively. These metallic Cu nanoparticles were added in CuTl-1223 superconducting matrix to get $(Cu)_x$/CuTl-1223; x = 0 ~ 4.0 wt. % nanoparticles-superconductor composites and their temperature dependent magneto-transport properties were studied. The zero-field-cooled (ZFC) and field-cooled (FC) temperature dependent magnetization (M-T) measurements of $(Cu)_x$/CuTl-1223 samples showed an increase in transition temperature and in amplitude of diamagnetic signal after the inclusion of Cu nanoparticles in the host CuTl-1223 matrix. This improvement in these magneto-transport properties can be attributed to the increase in number of efficient pinning centres in CuTl-1223 matrix after addition of Cu nanoparticles. Magnetization hysteresis (M-H) loops were obtained at various operating temperatures from which the magnetization critical current density ($J_c$) was estimated using Bean's critical state model. M-H loops indicated the combined superconducting and ferromagnetic behaviour up to 90 K in all $(Cu)_x$/CuTl-1223 samples. Improvement in $J_c$ could also be due to increase in number of pinning centres with addition of Cu nanoparticles in CuTl-1223 matrix. Maximum improvement in magneto-transport properties of $(Cu)_x$/CuTl-1223 samples was observed for