Temperature dependence of power-law index in $(Nd_xSm_xGd_{1-2x})Ba_2Cu_3O_{7-\delta}$ films

Xiao-Fen Li and Jean-Claude Grivel

Material research division, Risø national laboratory for sustainable energy, Technical University of Denmark.

Superconducting $(Nd_xSm_xGd_{1-2x})Ba_2Cu_3O_{7-\delta}$ films with x=0, 0.1, 0.25, 0.33 were grown by PLD on STO single crystal substrates. Films are made at 760°C and 790°C under different Oxygen partial pressures. Pure Gd films have high power-law index n around 31 at temperatures very close to the critical temperature (T_c). With addition of Nd and Sm, n is low at about 1K below T_c and increases slowly with decreasing temperature, even for the films with x=0.1, who have higher critical current density than the pure Gd ones. T_c was lowered by addition of Nd and Sm. The mixed rare earth films also tend to have a longer penetration depth near Tc. These properties might be related to the distortion of the superconductor lattice due to different ion sizes.