Thermodynamic properties of superconducting $CuBa_2Ca_3Cu_4O_{11+\delta}$ (Cu1234) system

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The well-known high-T_c superconductors such as La-, Y-, Bi-, Tl- and Hg-systems are not good enough to satisfy the necessary condition in irreversible field of the order of 30 T at 77 K for high field superconducting magnetic energy storage (SMES), mainly because of their too low superconducting state transition temperature or too high anisotropy of superconducting state properties. Superconducting state properties of the $CuBa_2Ca_3Cu_4O_{11+\delta}$ (Cu1234) system, with transition temperature as high as 118 K, has been investigated in the current work. AC susceptibility measurements confirmed very sharp transition to superconducting state. The upper critical field, H_{c2}, as high as 46.5 T at 95 K has been determined in dc SQUID magnetization measurements. However, critical current density, j_c, determined from magnetic hysteresis loop, is very low. It is supposed that the weak intergrain connections of studied material are the cause of small j_c values.