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EFFECT OF FLUX PINNING AND GRAIN-BOUNDARIES OF Ca AND Sr DOPED *YBCO*

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Practical applications of High Temperature Superconductor (*HTSc*) materials become limited due to low values for some superconducting parameters such as critical current density and critical field. It has been identified that the inter-grain weak links and poor flux pinning capability play very crucial role in determining these superconducting parameters. The aim of this study was to investigate the flux pinning nature and inter- granular couplings, which are the key factors in determining the critical current density of Ca and Sr doped YBCO systems. Polycrystalline samples of $Y_{1-x}Ca_x(Ba_{1-y}Sr_y)_2Cu_3O_{7-\delta}$ (with nominal composition of x = 0.00, 0.05, 0.10, 0.15, and y = 0.00, 0.025, 0.05, 0.10) were synthesized through conventional solid state reaction route. The phase formation was determined through *X-ray* powder diffraction, using *Rigaku X-ray* diffractometer (Cu-K_α). The *ac/dc* susceptibility (χ-*T*) and Isothermal Magnetization (*M-H*) were measured by Physical Properties Measurement System (*Quantum Design*-USA PPMS-14Tesla). In both series of samples there was a remarkable increase in separation between Field Cooled magnetization (*FC*) and Zero Field Cooled magnetization (*ZFC*) along with decreasing *FC* signal. This is a clear indication of flux pining which enhance the critical current. *ac* magnetization measurements of both Ca and Sr doped samples reveal that both doped samples possess with enhanced grain couplings which may lead to enhance the critical current. The critical current densities of two series of doped samples were calculated by means of ac susceptibility measurements and isothermal magnetization measurements. Global critical current density of Ca doped (in smaller contents) samples and inter-grain current density of Sr doped samples enhance three times more than the pristine sample. This could be explained as a consequence of improvement of inter-grain couplings and enhancement in flux pinning.

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