In-situ Fabrication of Co-doped SrFe$_2$As$_2$ Thin Films by Pulsed Laser Deposition with Excimer Laser

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The recent discovery of classes of Fe-based layered superconductors has attracted much attention to basic superconducting mechanism and practical application because of remarkably high superconducting transition temperature ($T_c$) and zero-temperature upper critical field ($H_{c2}(0)$) despite of ferromagnetic material base. These properties make the prospect for superconducting electronics. However success in superconducting electronics has been limited because of difficulties of fabricating high quality thin film. Here we report the growth of high-quality c-axis oriented Co-doped SrFe$_2$As$_2$ thin films with bulk superconductivity by a pulsed laser deposition (PLD) technique using 248-nm-wavelength KrF eximer laser and As-rich phase (about 30%) target to prevent the deficiency of As in thin film. The thin film show higher superconducting transition temperature, low resistivity and smooth surface. We firstly reported magnetization versus temperature and field curve showing strong diamagnetism and transport critical current density ($J_c$). These results supply necessary information for practical application of Fe-based superconductor.

Keywords: Iron-based superconductor, thin film