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Over the past two decades, YBa2Cu3O7-δ (YBCO) has aroused great research interests, owing to its high transition temperature (Tc) of above 90 K and some other advantages. However, most of the practical applications of YBCO coated conductors require high electrical current transport properties under magnetic field with little or even no losses, which means high in-field critical current density (Jc) is needed. Therefore, tremendous research has been focused on Jc improvement for YBCO thin films. One effective way is to introduce defects by designed nanostructure landscapes, so far, 0-D nanoparticles, 1-D nanowires and 2-D nanosheets have been reported for effective defect pinning enhancement. Magnetic pinning is another method to enhance the Jc values for YBCO thin films, by the interaction between the fluxons and the magnetic inclusions. However, there are very limited reports on the combination of defect and magnetic pinning together to further improve the Jc values. In this thesis, both defect and magnetic pinning are introduced by incorporating designed vertically aligned nanocomposite (VAN) layers, which include magnetic portion, (La0.67Sr0.33MnO3)(CeO2)1-x are introduced as either cap layer or buffer layer into YBCO thin films for the pinning enhancement, as CoFe2O4 and La0.67Sr0.33MnO3 are both magnetic materials. Furthermore, VAN/YBCO multilayers are also successfully grown for effective pinning enhancement. By these doping methods and designed architectures, both magnetic and defect pinning are involved, and the superconducting properties are improved. In another side, several iron based superconductors have been discovered, and FeSe with the simplest structure and a transition temperature (Tc) around 8 K arouses much research interest. Up to date, most of the research efforts in this field is to improve the Tc value of iron chalcogenide thin films. In this thesis, the pinning effects is studied for the superconducting FeSeTe1-x thin films by nanoinclusions, such as CoO2 nanolayer, which was proved to be able to create effective defect pinning centers for FeSeTe1-x thin films. In addition, (CoFe2O4)0.1(CeO2)0.9 VAN layer is also incorporated for both defect and magnetic pinning. Last but not the least, FeSeTe1-x thin films have been deposited on various kinds of substrates, including single crystal STO, amorphous glass, Si with or without a SiOx protection layer, an even metal substrate without a complicated set of buffer layers. Surprisingly, the FeSeTe1-x thin films can be grown along the c-direction on all the different substrates, even on amorphous glass and metal substrates, which demonstrates a very simplified and cost-effective approach of this Fe-based coated conductor for potential high field applications.