The YBCO Films with Zr$^{4+}$ Doping Grown by MOD Method

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Abstract—YBa$_2$Cu$_3$O$_{7-\delta}$ (YBCO) films with Zr doping have been prepared successfully by the trifluoroacacetate metal-organic deposition (TFA-MOD) method through dissolving Zr acetylacetonate into the precursor solution. Yttria-stabilized zirconia YSZ nanoparticles were detected in the doped YBCO films by XRD and SEM. From the analysis of XRD $\omega$ and $\phi$ scans, the doped films have better out-of-plane and in-plane textures than those of the un-doped YBCO film. Although the doped YBCO films have lower $T_c$ than that of the un-doped YBCO film, a very significant enhancement of $J_c$ is displayed as compared to the undoped film at applied fields. A high $J_c$ near 105 A cm$^-2$ at 2 T, 77K was observed in the Zr doped film, which is 30 times of the $J_c$ values for the un-doped film in the same applied fields, indicating that an effective pinning force was created by Zr doping.

Index Terms—Nanoparticle doping, TFA-MOD, YBCO film

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