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Preparation of biaxially textured $Ce_{1-x}(Y_{0.2}Zr_{0.8})_xO_\delta$ buffer layers on RABiTS NiW tapes by chemical solution deposition

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Abstract:

Highly (100)-oriented $Ce_{1-x}(Y_{0.2}Zr_{0.8})_xO_\delta$ (CYZO) films were prepared on biaxially textured NiW substrates by a chemical solution deposition approach using metal inorganic salts as starting materials. It has been found that both the preferential orientation and surface roughness of CYZO films decrease gradually with increasing of the doping percentage of Y^{3+} and Zr^{4+} ions. The epitaxial growth relationship of $(220)_{CYZO}//(200)_{NiW}$ and $[00l]_{CYZO}//[001]_{NiW}$ was demonstrated by XRD texture measurement as well as atomic resolution STEM observation. XRD, Raman and XPS spectra results indicate that Y^{3+} and Zr^{4+} ions were indeed introduced into CeO_2 lattice to substitute Ce^{4+} ions and form cubic fluorite CYZO solid solution. Moreover, CeO_2 buffer layer can be endowed a strong enough capability to prevent element diffusion through co-doping of yttrium and zirconium, provided that an optimal doping ratio of them is adopted. This will provide a new approach to fabricating strong-barrier single buffer layer for coated conductor.