Effect of the Thickness of CeO_2 Buffer Layer on the YBCO Coated Conductor

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The multilayer of CeO_2/YSZ/Y_2O_3/Ni or NiW is one of the standard architectures of buffer layer for fabrication of YBCO coated conductor through RABiTS approach. The pulsed laser deposition (PLD), DC magnetron sputtering and thermal evaporation were employed to deposit these buffer layers. On the top of buffer layer, YBCO film was deposited by PLD. In this report, CeO_2 film with different thickness was deposited by PLD on the top of YSZ/Y_2O_3 buffer layer which was deposited by either only PLD method or thermal evaporation and DC magnetron sputtering. The effects of thickness of CeO_2 film on the texture of CeO_2 film and YBCO film, furthermore, on critical current density (J_c) of YBCO film were studied. For the case that YSZ/Y_2O_3 was deposited by PLD, there was a self-epitaxy effect with the increase of CeO_2 film. For YSZ/Y_2O_3 which was deposited by thermal evaporation and DC magnetron sputtering, the cap layer of CeO_2 film deposited by PLD significantly improved the quality of buffer layer, therefore increased the Jc of YBCO film. However, there was not a self-epitaxy effect with the increase of CeO_2 film. The X-ray diffraction (XRD) θ - 2θ scan, ω- scan and θ - scan were used to examine the in-plane and out-of–plane texture of both buffer layer and YBCO film. The standard four probe electrical measurement was used to measure the critical temperature T_c and critical current I_c.

keywords: YBCO film, coated conductor, buffer layer, CeO_2

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