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Deposition temperature dependence of YBCO transport properties JIE WANG, J.H. KWON, J. YOON, H. WANG, Texas A&M University, T.J. HAUGAN, F.J. BACA, N.A. PIERCE, P.N. BARNES, Air Force Research Laboratory — In this paper, we report a strong correlation between the stacking fault (SF) density and the critical current density of $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ (YBCO) thin films in an applied field (J_{cin} -field). High quality superconducting YBCO thin films (thickness $\sim 300 - 350$ nm) were deposited on SrTiO_3 (STO) and LaAlO_3 (LAO) substrates using a pulse laser deposition (PLD) technique. We found that the J_{cin} -field increases as the deposition temperature increases ($775^\circ\text{C} - 825^\circ\text{C}$) for the samples grown on both STO and LAO substrates. Detailed microstructural studies including cross-section transmission electron microscopy (TEM) and high resolution TEM were conducted for all the films deposited on STO substrates. The YBCO SF density increases from $\sim 4.0 \times 10^5/\text{cm}$ to $\sim 1.2 \times 10^6/\text{cm}$ as the deposition temperature increases from 775°C to 825°C . An interesting linear relation is observed between the SF density and the J_{cin} -field value, which suggests that the YBCO SF density plays an important role in the YBCO in-field transport performance.

Jie Wang
Texas A&M University

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