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Thickness dependence of J_c of YBCO coatings produced by a BaF_2 *ex situ* process*

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YBCO films with thickness ranging from 0.1 to 5 μm were grown on single crystal oxide and coated conductor substrates (RABiTS and IBAD-YSZ) using a BaF_2 *ex situ* process. Precursors of the targeted thickness were deposited by e-beam evaporation of Y, BaF_2, and Cu. The precursors were converted into YBCO during a single *ex situ* anneal at average growth rates of 0.5-1 Å/s. Annealing conditions were adjusted to induce c-axis growth at all values of the precursor thickness. J_c decreases with the YBCO thickness on all substrate materials; however, the rate appears to be substrate dependent. Remarkably, the fastest J_c decrease (on an absolute as well as relative scale) occurs on (100) $SrTiO_3$ substrates, where J_c(77 K) drops from 5.5 to 2 MA/cm^2 in the interval 0.1-1.5 μm. J_c is lower for YBCO on RABiTS and IBAD-YSZ because of texture related effects, however, exhibits a weaker thickness dependence. Hence, the total critical current I_c continues to increase with the YBCO thickness, reaching values of about 250 A/cm-width for ~3 μm thick coatings at 77 K. The origin of the thickness dependence, differentiated towards *intra*granular and grain-boundary J_c, is under investigation.

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