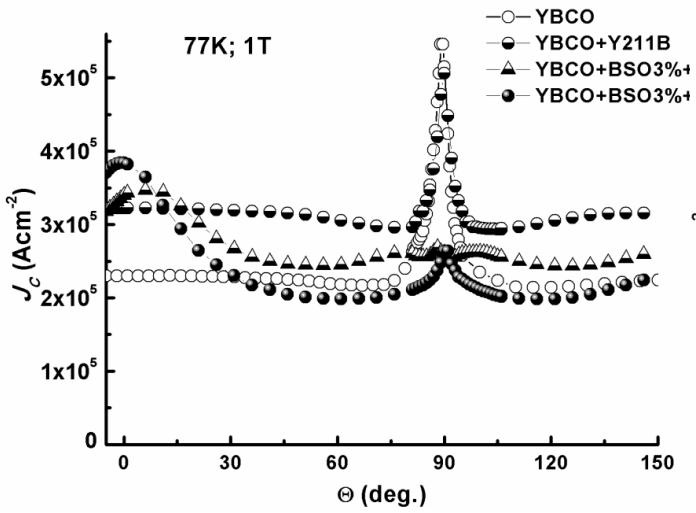
Tuning the angular variation of J_C of YBCO thin films by incorporating different combinations of hybrid APCs

○(P)Alok K. Jha[1], Kaname Matsumoto[1], Tomoya Horide[1], Shrikant Saini[2], Paolo Mele[2], Yutaka Yoshida[3] and Satoshi Awaji[4]

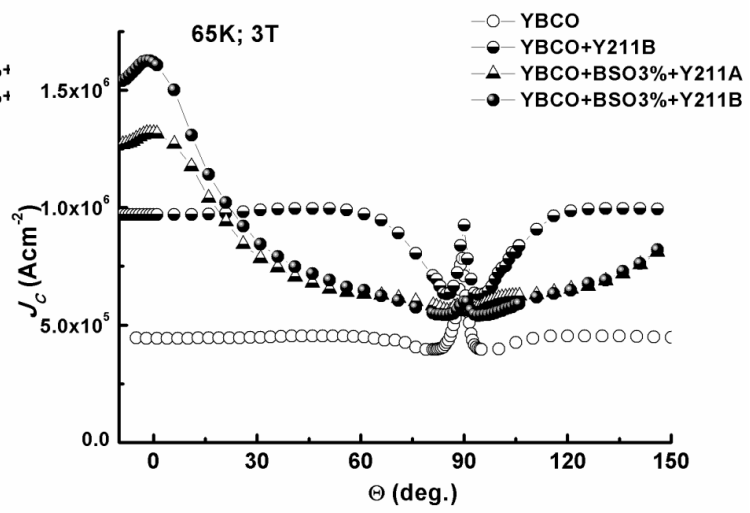
[1]Kyushu Institute of Technology, [2]Hiroshima University, [3]Nagoya University, [4]Tohoku University

E-mail: akjha@post.matsc.kyutech.ac.jp

In this paper, we discuss the effect of hybrid (columnar and planar) artificial pinning centers (APCs) on the vortex pinning properties of YBCO thin films. The structural, microstructural and transport properties of YBCO thin films with varying concentration of $BaSnO_3$ (BSO) and Y_2BaCuO_5 (Y211) nanoscale inclusions will be presented. The effect of systematic incorporation of hybrid APCs on the critical current properties of YBCO thin films on single crystal substrates will be discussed in detail. Mixed targets of YBCO+BSO with Y211 sectored piece on the top have been used for the deposition of YBCO based nanocomposite thin films. Significant enhancement in the critical current density and pinning force density has been observed in the nanocomposite thin films both at 77 K and 65 K. Apart from the increased J_C and F_p values, the YBCO films incorporating hybrid APCs also exhibit enhanced J_C not only along the *c*-axis but also along intermediate angular regime. In the figure given below, it can be clearly observed that the J_C value is significantly improved in the intermediate angular regime. Controlling the proportion of hybrid APCs into YBCO thin film is expected to result in much better critical current density performance with reduced J_C anisotropy of YBCO thin films.



Angular variation of J_C for pristine YBCO and YBCO films incorporation hybrid APCs measured at 77 K, 1 T



Angular variation of J_C for pristine YBCO and YBCO films incorporation hybrid APCs measured at 65 K, 3 T