

Simulation of Current and Flux Pattern and Hysteretic Field Dependence of Critical Currents at Grain Boundary of Rectangular Bicrystalline HTSC Film

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The penetration of magnetic flux in high T_c superconductors is simulated for the realistic situation where a transverse magnetic field (H_z) is applied to a rectangular bicrystalline thin film. Star-like pattern of the penetration flux and the discontinuity lines are observed in fully penetrated critical state as Brandt's earlier papers. These lines are caused by sharp band of current stream lines at rectangular species diagonal. Highly nonlinear current-voltage law and iteration process were used in position dependent $H_z(x,y)$ calculation and this field is able to calculate the vortex density around grain boundary that shows the hysteretic behavior. As expressed the modified Kim model, Inter-grain critical current density (J_{cb}) depends on the vortex density at the grain boundary. We compared this calculated hysteretic field dependence of J_{cb} with that of previous measurements on various HTSC junctions deposited on bicrystalline STO substrates.

keywords : discontinuity lines, nonlinear current voltage law, modified Kim model.

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