Critical Currents at the Grain Boundary of $(Sm_{0.8}Dy_{0.2})$ $Ba_2Cu_3O_7$ Film under Oblique Magnetic Fields

Sunme Lim, Yonghwan Jung, Sangmoo Lee, Yehyun Jung, and Dojun Youm
[a]*Physics Department, KAIST, 305-701 Daejon, Korea*

We measured critical current densities (J_{cb}) at the 30° grain boundary of a bicrystalline $(Sm_{0.8}Dy_{0.2})$ $Ba_2Cu_3O_7$ film under various magnetic fields (H_a), which were applied obliquely. We varied the field from –0.7KOe to +0.7KOe while the angles (□) of the fields were 2°, 22.5°, 45°, 67.5° and 90° with respect to the film surface. The curves of J_{cb} vs H_σ showed the well-known butterfly-like hysteretic curves. We separated the two components of field, $H_\perp$ and H_F, which are normal and parallel to the film surface, respectively. Our data indicate that the roles of these two components for the field dependence of J_{cb} are different. We combined the effect of $H_\perp$ deduced from the data for the normal field (□=90) and the effect of H_F deduced from the data for the almost parallel field (□=2°). Multiplying the independent reduction factors deduced from these two cases, we found a new formula, which expresses J_{cb} vs H_σ for general □s. All the experimental data for various □s fit well to this new formula.