

Magnetic Field Dependence of Critical Current and Index n in a Bi-2223/Ag Superconducting Tape

Jung Ho Kim^a, Kyu Tae Kim^a, Jun Hyung Lim^a, Seok Hern Jang^a,
Yun Bong Rho^a, Jinho Joo^{*a}, Seyong Choi^b, Wansoo Nah^b

^a School of Metallurgical and Materials Engineering, Sungkyunkwan University, Suwon, Korea

^b School of Information and Communication Engineering, Sungkyunkwan University, Suwon, Korea

We fabricated Bi-2223/Ag superconductor tape with 55 filaments and estimated the magnetic field dependence of critical current (I_c) and index n (n) up to 30 T at 4.2 K. The I_c and n were characterized as a function of external magnetic field parallel to the tape surface on increasing and decreasing field, using a 35 T hybrid magnet. The I_c was estimated to be 325 A in self-field at 4.2 K, and n was 32, 22, and 26 in the electric field range of 0.1~1 $\mu\text{V}/\text{cm}$, 1~10 $\mu\text{V}/\text{cm}$, and 0.1~10 $\mu\text{V}/\text{cm}$, respectively. It was observed that I_c was dependent on magnitude of magnetic field and it decreased exponentially as the field increased; in a parallel and increasing field, I_c was 128 A at 30 T which is approximately 40% of critical current at self-field. In addition, the I_c was higher on decreasing field than that on increasing one and this difference became smaller at field higher than 20 T. On the other hand, n did not significantly depend on field strength up to 30 T, nor varied on whether increasing or decreasing field; n value in 0.1~1 $\mu\text{V}/\text{cm}$ was 23.0 ± 5.2 and 27.8 ± 8.0 on increasing and decreasing field, respectively, in the range of 0~30 T. The n value on decreasing magnetic field was slightly higher than that on increasing field. This hysteresis behavior of n was similar to that of I_c , which is related to the trapped flux at the grain boundary.

keywords : $B-I_c(n)$ characteristic, E-J characteristic, Index n , NMR insert magnet

Acknowledgement

This work was supported by Korea Research Foundation Grant (KRF-2003-041-D00268)