The Investigation of Contact Surface Regions between MgB_2-core and SUS-tube for MgB_2/SUS Tapes

K. J. Song[a], N. J. Lee[a], H. M. Jang[a], H. S. Ha[a], D. W. Ha[a], S. S. Oh[a], M. H. Sohn[a], R. K. Ko[a], C. Park[a], Y. K. Kwon[a], and J. H. Joo[b]

[a] *Applied Superconductivity Group, Korea Electrotechnology Research Institute, Changwon, Korea*

[b] *School of Metallurgical and Materials Engineering, Sungkyunkwan University, Suwon, Korea*

We have fabricated single-filament composite MgB_2/SUS tapes that were performed by powder-in-tube (PIT) processes. Surprisingly, the transport critical currents of non-sintered MgB2/SUS tapes are much higher than sintered one's. The transport critical currents of the tapes $I_c \sim 316$ A and ~ 105 A were observed at $T = 4.2$ K with $H = 0$ G for non-sintered and sintered MgB_2/SUS tapes, respectively. We investigated the cross sections of the sintered as well as the non-sintered tapes, employing SEM and EPMA. Impurity phases such as MgO or MgB_4 for the sintered tapes were observed by XRD analyses as well. In addition to MgO or MgB_4 phases, contact surface regions between MgB2 core and SUS tube for the sintered tapes have found much wider than the non-sintered one's. Some reacted traces of the Ni, Cr, or Mn components of the commercial SUS-tube were found at the contact surface between MgB_2 core and SUS tube for the sintered MgB_2/SUS tapes by EPMA line profiles, too. On the other hand, the isothermal magnetizations $M(H)$ of the sintered MgB_2/SUS tapes and the commercial MgB_2 powder were measured at temperature T between 5 and 50 K in fields up to 6 T, employing a PPMS-9. The persistent current density (J_p) values, which were obtained from Bean model, were observed more than $\sim 5 \times 10^5$ A/cm^2 and $\sim 5 \times 10^7$ A/cm^2 at $T = 10$ K with $H = 0$ G for the sintered MgB_2/SUS tapes and the commercial MgB_2 powders, respectively. The composite metal-clad MgB_2 tapes could be offer shining visions of reaching much higher persistent critical current density by better controlling of contamination and optimizing of the processes during fabrication.

keywords : MgB_2/SUS tapes, sintering or non-sintering, critical currents, magnetization.