

# The Fabrication of MgB<sub>2</sub>/SUS Tapes by PIT Process

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We have fabricated successfully single-filament composite MgB<sub>2</sub>/SUS tapes, as an ultrarobust conductor type. The fabrication of the MgB<sub>2</sub>/SUS tapes was performed by power-in-tube (PIT) process such as swaging and cold rolling. The remarkable transport critical current ( $I_c$ ) of the nonsintered MgB<sub>2</sub>/SUS tapes has observed, unlike high- $T_c$  superconductor Bi-2223/Ag tapes. The transport critical currents, that were measured by using a standard dc four-probe method,  $I_c \sim 316$  A and  $\sim 82$  A were observed at  $T = 4.2$  K and 20 K, respectively, for nonsintered MgB<sub>2</sub>/SUS tapes. In addition, the isothermal magnetization  $M(H)$  of the sintered MgB<sub>2</sub>/SUS tapes was measured at temperature  $T$  between 5 and 50 K in fields up to 6 T, employing a PPMS-9 (Quantum Design). The persistent current density ( $J_p$ ) values were obtained from the  $M(H)$  data, using Bean model, for the sintered MgB<sub>2</sub>/SUS tapes. The values were observed more than  $\sim 7 \times 10^5$  A/cm<sup>2</sup> and  $\sim 1.2 \times 10^5$  A/cm<sup>2</sup> at  $T = 5$  K and 30 K, respectively, with  $H = 0$  G. On the other hand, we investigated the cross sections of the sintered as well as nonsintered tapes, employing both SEM and EPMA. The superconductor core cross section areas of the tapes that show irregular forms are about 0.67 and 1.13 mm<sup>2</sup> for the sintered and nonsintered tapes, with the superconductor filling factor of about 19.5 and 30 %, respectively. No evidence of significant diffusion and reaction between MgB<sub>2</sub> and SUS tube is found in both the SEM and the EPMA. However, an impurity phase such as MgO, which might be generated inside the superconductor MgB<sub>2</sub> core during fabrication, was observed by EPMA line profiles. In addition, a little bit reacted traces of Cr or other components inside the commercial SUS-tube was found at the boundary between MgB<sub>2</sub> and SUS tube, too. There are still large open areas to understand and to improve the superconductivity for the metal-clad MgB<sub>2</sub> wires/tapes. These and other results will be discussed.

keywords : MgB<sub>2</sub>/SUS tapes, PIT, sintering, nonsintering, transport critical current