Abstract of Presentation

Improved superconducting properties of *in situ* MgB_2 wires after Cold High Pressure Densification: fundamental investigation

Abstract :

The cold high pressure densification technique (CHPD) was recently developed in Geneva for improving the in-field critical current density J_c in *in situ* binary and alloyed MgB_2 wires and tapes [1, 2]. Alloyed wires with various carbon sources were treated (nano C, SiC, $C_4H_6O_5$). For square wires alloyed with 10wt% $C_4H_6O_5$, the highest J_c values were recently obtained as $J_c = 10^4$ A/cm^2 at 13.4 T [2], the behaviour being almost isotropic. In order to understand the fundamental mechanism behind this improvement of J_c, the properties of binary and alloyed MgB_2 wires were investigated before and after CHPD, using resistivity, specific heat and magnetization measurements in the temperature range between 5 and 35 K at magnetic fields up to 15 T.

It was found that the effect of the densification process on the electrical and transport properties is related to the enhancement of the MgB_2 filament mass density and thus to the improved grain connectivity. A model is proposed for explaining the reported enhancement of J_c and B_{irr} on the basis of the calorimetric T_c distribution measured on binary and alloyed MgB_2 wires and bulk samples.

Densification on powder metallurgically prepared filaments and the investigation of its effects on the flux pinning are being presently extended to other superconducting systems, e.g. Bi2212 and FeAs-122.

[1] R. Flükiger, M.S.A. Hossain, C. Senatore, *Strong enhancement of J_c in binary and alloyed in-situ MgB_2 wires by a new approach: Cold High Pressure Densification,* Supercond. Sci. Technol. **22** (2009) 085002.

[2] M.S.A. Hossain, C. Senatore, M.A. Rindfleisch, M.J. Tomsic, J. H. Kim, S. X. Dou , R. Flükiger, *Enhancement of J_c and B_{irr} of in situ MgB_2 wires and tapes alloyed with $C_4H_6O_5$ (malic acid) after cold densification,* Supercond. Sci. Technol. **22** (2009) 095004.