

WBP1-1

Improved performance of bulk MgB₂ superconductor produced via combination of in-situ and ex-situ method

*Jun Sugiyama¹, Joseph. L Dadiel¹, Naomichi Sakai¹, Miryala Muralidhar¹, Kazuya Yokoyama², Tetsuo Oka¹, Masato Murakami¹

Shibaura Institute of Technology, Japan¹
Ashikaga University, Japan²

In this study, we propose a combination of in-situ method and ex-situ method, which are typical fabrication techniques in bulk MgB₂ superconductor system, to achieve high density as well as improve the critical current density (J_c). The bulk MgB₂ sample was synthesized with varying ex-situ powder (pre-synthesized powder) content such as 0, 10, 15, 20, 25 and 30wt% in conjunction with in-situ method followed by sintering at 775°C for 3 hours in Ar atmosphere. As a result, it was observed that the filling rate, which represents the index of density, increased by 1% for every 5wt% increase of the ex-situ powder. Among all the samples, the 20wt% ex-situ added sample showed the highest J_c value of 321 kA / cm² at 20 K and self-field. Furthermore, it can be observed that all the ex-situ powder-added MgB₂ samples exhibit superiority in J_c values at the high magnetic field when compared with the sample fabricated by the in-situ method alone.

Keywords: in-situ, ex-situ, combination method, critical current density