Study on Nano-SiC added MgB2 synthesized by using higher boride phase as a precursor.

Abstract

Both pure and nano-SiC added MgB2 were prepared by reaction of higher boride phase (MgB4) and Mg in a two-step sintering method. The first step involved a high temperature (1050 °C) synthesis of MgB4. However, this reaction gave rise to significant amount of MgO. Hence, acid treatment was done in order to remove MgO while retaining MgB4 as dominant phase. The second step was followed by the introduction of an appropriate amount of Mg into the acid washed MgB4 powders to form MgB2 at a lower sintering temperature (750 °C). Nano-SiC was added according to 2 wt%, 5 wt% and 10 wt% respectively. Both pure and added samples show MgB2 as a dominant phase. The added samples show other minor phases of Mg2Si, MgO, MgB4 and some unreacted SiC was also found. The Scanning Electron Micrographs revealed the well defined hexagonal shape of MgB2 grains and the microstructure is denser with reduced porosity as compared to the in-situ reaction of (Mg + B) samples. The density was found to increase upon increasing the SiC addition level. The superconducting properties were studied and reported as well. The MgB2 added with 2 wt% SiC has the highest transition temperature of 37K while MgB2 with 5 wt% SiC exhibits the highest Jc value at 5K at the applied field of 5T among all the added samples.

Keyword: MgB2; MgB4; Nano-SiC; Acid treatment; Superconducting properties.