X-ray powder diffraction study on the MgB2 superconductor reacted with nano-SiC: the effects of sintering temperature

Abstract

SiC added MgB2 polycrystalline samples were synthesized at low (650°C) and high (850°C) temperatures in order to study the sintering effect on the phase formation and superconducting properties. The MgB2 bulks with additions of 0wt%, 1wt%, 3wt% and 5wt% SiC were studied with powder X-ray diffraction technique. We observed that MgB2 remained as the primary phase for both sintering temperatures in all samples with the presence of MgO and Mg2Si as the main impurities. Some diffraction peaks associated with unreacted SiC is also noticeable. The relative intensity of the Mg2Si peaks was found to decrease in samples sintered at higher temperature. Temperature dependent magnetic moment measurements showed that the superconducting transition temperature, Tc decreases as the SiC addition level increases while lower sintering temperature degrades Tc to a greater extent. The changes in the physical properties is discussed based on the results of phase formation, full width half maximum (FWHM), lattice parameter and crystallite size.

Keyword: MgB2; Sintering temperature; SiC; XRD