

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, T_c decreases as the SiC addition level increases while lower sintering temperature degrades T_c 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