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P. Vivekanandhan, R. Murugasami, S. Kumaran

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Rapid *in-situ* Synthesis of Nanocrystalline Magnesium Silicide thermo-electric compound by Spark Plasma Sintering

P.Vivekanandhan¹, R.Murugasami¹, S.Kumaran^{1*}

¹Green Energy Materials and Manufacturing Research Group,
Department of Metallurgical and Materials Engineering,
National Institute of Technology, Tiruchirappalli – 620015, Tamil Nadu, India.

*Corresponding E-Mail: kumara@nitt.edu

Abstract

Magnesium Silicide (Mg_2Si) is the one of the most attractive and promising green thermo-electric material to convert the heat in to electricity in the mid temperature range (RT to 600°C). However, synthesizing of Mg_2Si compound through liquid and solid state processing carries several challenges such as processing time, inhomogenous stoichiometry and phase purity. The alternative method is demonstrated by rapid *in-situ* synthesis of pure nano-crystalline Mg_2Si doped with Bi (0-0.025at.%) by spark plasma sintering (SPS). XRD and electron microscopy studies confirm the formation of Mg_2Si compound and EDS confirm chemical and doping homogeneity. The superior power factor of $11\mu V/cm-k^2$ is achieved at 550°C.

Keywords: Magnesium silicide; Thermo-electric material; Semiconductor; Spark plasma sintering; Electron microscopy

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