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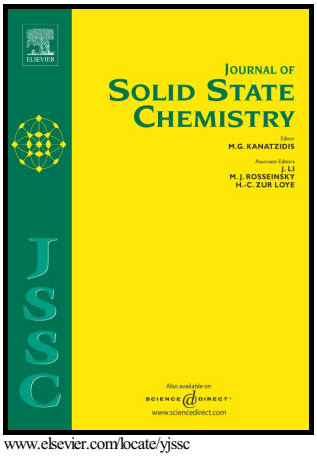

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Control of Mg content and carrier concentration via post annealing under different Mg partial pressures for Sb-doped Mg_2Si thermoelectric material

Daisuke Kato[1,2,*], Kouta Iwasaki[1], Masahito Yoshino[2], Tomoaki Yamada[2], Takanori Nagasaki[2]

1. Toyota Boshoku Corporation, 1-1, Toyoda-cho, Kariya, Aichi 448-8651, *Japan.*

2. Graduate School of Engineering, Nagoya University, Furo-cho, Chikusa-ku, Nagoya, Aichi 464-8603, *Japan.*

*Corresponding Author: Daisuke Kato

E-mail: daisuke.kato2@toyota-boshoku.com

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Abstract

An approach to control the Mg content in Sb-doped Mg_2Si via post annealing under different Mg partial pressures is developed. Annealing under low and high Mg partial pressures ($\leq 1\times10^{-1}$ Pa and 1×10^{1} Pa) result in low and high carrier concentrations of $Mg_2Si_{0.99}Sb_{0.01}$ (1.2×10^{20} cm^{-3} and 1.7×10^{20} cm^{-3}) that correspond to a hypo-stoichiometric and a hyper-stoichiometric compositions, respectively. $Mg_2Si_{0.99}Sb_{0.01}$ with a hypo-stoichiometric composition shows a low figure of merit below 573 K mainly due to a reduction of the carrier mobility probably by the carrier scattering at Mg-deficient grain boundaries. The carrier mobility and the figure of merit are recovered by increasing the Mg content via annealing under high Mg partial pressure, which indicates that the annealing process is an effective way to recover the thermoelectric performance of Mg-deficient Mg_2Si-based materials.

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