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Athorn Vora-ud, Mati Horprathum, Manish Kumar, Pennapa Muthitamongkol, Chanunthorn Chananonawathorn, Bunpot Saekow, Intira Nualkham, Somporn Thaowonkaew, Chanchana Thanachayanont, Tosawat Seetawan

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Effect of Ag Mixing in Thermoelectric Ge₂Sb₂Te₅ Thin Films

Athorn Vora-ud^{a,b,*}, Mati Horprathum^c, Manish Kumar^d, Pennapa Muthitamongkol^e,
Chanunthorn Chananonwathorn^c, Bunpot Saekow^c, Intira Nualkham^f, Somporn Thaowonkaew^b,
Chanchana Thanachayanont^e and Tosawat Seetawan^{a,b}

^a Program of Physics, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, 680 Nittayo Road.,
Mueang District, Sakon Nakhon 47000, Thailand

^b Thin Films Laboratory, Center of Excellence on Alternative Energy, Research and Development Institution,
Sakon Nakhon Rajabhat University, 680 Nittayo Road., Mueang District, Sakon Nakhon 47000, Thailand

^c National Electronics and Computer Technology Center, 114 Thailand Science Park, Paholyothin Rd., Klong 1,
Klong Luang, Pathumthani 12120, Thailand

^d Centre for Advanced Materials, Organisation for Science Innovations and Research, Bah 283104, India.

^e National Metal and Materials Technology Center, National Science and Technology Development Agency,
Pathumthani 12120, Thailand

^f Department of Physics, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Chalokkrung
Rd. Ladkrabang, Bangkok, 10520, Thailand

Abstract

Ag-added Ge₂Sb₂Te₅ thin films were prepared by a pulsed-DC co-magnetron sputtering process using Ge₂Sb₂Te₅ and Ag targets. The effect of variation in Ag content through variable power on Ag target was studied on the microstructural and thermoelectric properties of as-deposited and fast annealed thin films at 400 °C in a vacuum. It is found that Ag addition induces enhancement in conductivity. When the power on Ag target is exceeded to a critical power, Ag₈GeTe₆ phase formation occurs mixed with Ge₂Sb₂Te₅ cubic structure which limits the thermoelectric performance. Best conditions provide the films having a lowest electrical resistivity as $0.98 \times 10^{-4} \Omega \text{ cm}$ and the maximum power factor as $5.83 \times 10^{-3} \text{ W m}^{-1} \text{ K}^{-2}$.

Keywords: thermoelectric thin film; Ag-added Ge₂Sb₂Te₅; Ag₈GeTe₆; co-magnetron sputtering

* Corresponding author. E-mail address: athornvora-ud@snu.ac.th, Tel.&Fax: +664-274-4319

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