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Thermoelectric properties of $SnSe_{1-x}S_x$ ($0 < x \leq 1$) single crystals THI MINH HAI NGUYEN, ANH TUAN DUONG, GANBAT DUVJIR, THI LY TRINH, VAN QUANG NGUYEN, JUNGDAE KIM, SUNGLAE CHO, University of Ulsan, Ulsan — Tin selenide (SnSe), a p-type semiconductor, has attracted many attention due to its excellent thermoelectric efficiency, i.e., ZT = 2.6 along the b-axis of its high temperature phase. This issue has renewed interests in thermoelectric properties of the materials which adopted the same layered structure as SnSe, such as SnS, GeS, and GeSe. Among these compounds, tin (II) sulfide (SnS) is exceptionally attractive because of its natural abundance and low toxicity. However, the experimental results show that SnS has possessed a small value of the figure of merit. To optimize the thermoelectric performance of SnS, making solid solution is a potential way. That is our motivation for the investigation of $SnSe_{1-x}S_x$ single crystals' thermoelectric properties. In this study, $SnSe_{1-x}S_x$ ($0 < x \leq 1$) single crystals were fabricated using the temperature gradient method. The crystal structure was investigated by SEM and XRD, which indicated that fabricated $SnSe_{1-x}S_x$ single crystals have layered structure with lattice constants change gradually following Vegard's law. Transport properties were synthesized by physical properties measurement system (PPMS). We observed that for x = 0.2, $SnSe_{0.8}S_{0.2}$, electrical resistivity and Seebeck coefficient were 0.52 Ω·cm and 639.36 μVK^{-1} at 270 K, respectively, which resulted in the power factor of 0.78 $\mu WK^{-2}cm^{-1}$. Furthermore, we will discuss about the thermal conductivity and microscopic surface structure of these samples.

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