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Enhancement of thermoelectric performance by phase seperation of Ag_2Te in quaternary $Ag_xBi_{0.5}Sb_{1.5-x}Te_{3-x}$ YOO JANG SONG, JONG-SOO RHYEE, Kyung Hee Univ - Suwon Campus, BONG SEO KIM, SU DONG PARK, Korea Electrotechnology Research Institute, JAE HOON JUNG, Korea University, BYUNG-GIL RYU, JONG RAE LIM, LG Advanced Research Institute — Quaternary Ag–Bi–Sb–Te alloys with the general formula of $Ag_xBi_{0.5}Sb_{1.5-x}Te_{3-x}$ are synthesized by solid state reaction for the high Ag doping x=0.1, 0.2, and 0.3. The powder x-ray diffraction analysis of the melted ingot shows the phase separation of $AgSbTe_2$ and $Bi_{0.5}Sb_{1.5}Te_3$ phases. After the hot press sintering at 350 °, we found $Ag_2Te/Bi_{0.5}Sb_{1.5}Te_3$ composite, instead of $AgSbTe_2$ phase separation, from the energy dispersive x-ray spectroscopy and x-ray diffraction measurements. The electrical conductivities of the $Ag_2Te/Bi_{0.5}Sb_{1.5}Te_3$ composite are significantly increased comparing with that of conventional *p*-type $Bi_{0.5}Sb_{1.5}Te_3$ compound, implying that the interface effect by phase separation can attribute to the increase of electrical conductivity. The maximum power factor and ZT values are reached up to 2.1 mW K^{-2} m^{-1} ($\sim$ 400 K) and 1.1 (at 570 K), respectively, for x = 0.1 composite.. Here we propose that the phase separation of Ag_2Te in $Bi_{0.5}Sb_{1.5}Te_3$ matrix can increase thermoelectric performance at mid-temperature temperature range.

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