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The achievement of high ZT in n-type SnSe single crystal SUNGLAE CHO, VAN QUANG NGUYEN, GANBAT DUVJIR, VAN THIET DUONG, University of Ulsan, Ulsan, SUYONG KWON, JAEYONG SONG, Korea Research Institute of Standards and Science (KRISS), Daejeon, JAEKI LEE, JIEUN LEE, SUDONG PARK, Korea Electrotechnology Research Institute (KERI), Changwon, TAEWON MIN, JAEKWANG LEE, Pusan National University, Pusan, THI MINH HAI NGUYEN, ANH TUAN DUONG, JUNGDAE KIM, University of Ulsan, Ulsan — SnSe is a two dimensional (2D) layered semiconductor with strong Sn-Se bonding along $b-c$ plane and weaker bonding along a axis direction, resulting in a strong anisotropic transport properties. Recently, Zhao *et al.* reported that high thermoelectric power factor and low thermal conductivity at high temperature make SnSe as a very good p-type thermoelectric material; ZT values along b and $c$axes are up to 2.6 and 2.3 at 923 K, respectively. They attributed the remarkably high ZT value along the b axis to the intrinsically low lattice thermal conductivity in SnSe. More recently, two first-principles calculations predicted good thermoelectric performances in both n- and p-type SnSe's and better n-type thermoelectric properties than p-type SnSe and J. Yang *et al.* predicted ZT˜3.1 in n- type SnSe. Here, we report that n-type SnSe single crystals were successfully synthesized by substituting Bi at Sn sites. In addition, it was found that the carrier concentration increases with Bi content, which has a great influence on the thermoelectric properties of n-type SnSe single crystals. Indeed, we achieved the maximum ZT value of 2.2 along b axis at 733 K in the most highly doped n-type SnSe with a carrier density of -2.1$\times$ 10^{19} cm^{-3} at 773 K.

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