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A study on the effect of Sn concentration on the transport properties of epitaxial $Bi_{2-\delta}Sn_{\delta}Te_3$ thin films SUYOUN LEE, SEONG WON CHO, KWANG-CHON KIM, SEONG KEUN KIM, BYUNG-KI CHEONG, JIN-SANG KIM, Korea Institute of Science and Technology, KOREA UNIVERSITY OF SCIENCE AND TECHNOLOGY COLLABORATION, ELECTRONIC MATERIALS RESEARCH CENTER TEAM — We have performed a systematic study on the transport properties of epitaxial $Bi_{2-\delta}Sn_{\delta}Te_3$ thin films with varying δ from the underdoped to the overdoped region. By compensating unintentional carriers doped by defects in Bi_2Te_3, the bulk conductivity has been found to be highly suppressed with a very small amount of Sn resulting in the insulating behavior of resistivity at high temperatures. Furthermore, from the temperature- and magnetic field-dependence of the longitudinal resistance and the Hall resistance, we have separately characterized the surface state showing that the phase-relaxation length of the surface state of Sn-doped Bi_2Te_3 films increases up to ˜250 nm at 1.8 K, about three times of that of the undoped Bi_2Te_3 film. And, finally, the magnetoresistance ratio (MR) of the Sn-doped Bi_2Te_3 films has been found to have a peak at a certain temperature, which is attributed to the carrier compensation similar to the semimetals.

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