

One-dimensional Bi-Te core/shell structure grown by a stress-induced method for the enhanced thermoelectric properties

Jooheon Kang¹, Jinhee Ham¹ and Wooyoung Lee^{*,1}

¹*Department of Materials Science and Engineering, Yonsei University, 134 Shinchon, Seoul, Korea*

Abstract : The formation of variable one-dimensional structures including core/shell structure is of particular significance with respect to potential applications for thermoelectric devices with the enhanced figure of merit ($ZT=S^2\sigma T/\kappa$). We report the fabrication of Bi-Te core/shell nanowire based on a novel stress induced method. Fig. 1 schematically shows the nanowire fabrication process. Bi nanowires are grown on the Si substrate by the stress-induced method, and then Te is evaporated on the Bi nanowires. Fig. 2 is a transmission electron microscopy image clearly showing a core/shell structure for which effective phonon scattering and quantum confinement effect are expected. Electrical conductivity of the core/shell nanowire was measured at the temperatures from 4K to 300K, respectively. Our results demonstrate that Bi-Te core/shell nanowire can be grown successfully by the stress-induced method. Based on the result of electrical transport measurement and characteristic morphology of rough surface, Seebeck coefficient and thermal conductivity of Bi-Te core/shell nanowires are presented.

key words : core/shell structure, stress-induced method, Bi-Te, thermoelectricity