Effect of Interfacial on Bi_2Te_3 Thin-Film Thermoelecric Module

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Abstract

The interfacial reaction between thermoelectric materials and metal electrode becomes crucial when decreasing the dimension of thin-film module. Serious atomic interdiffusion at the interface may affect the electrical and thermoelectric properties of the module. In this study, Bi_2Te_3 was selected as the n-type thermoelectric material in the module due to its small band gap (approximately 0.21 eV) and excellent zT values at room temperature range. Cu was chosen as the electrode for its high electrical conductivity. To simulate the operating condition, the modules were aged for different duration of times. Atomic diffusion in the thermoelectric thin films from the electrodes and its crystallographic relationship were also investigated. Thermoelectric properties were measured to understand the effect of the interfacial stability for the thin-film modules. To thoroughly investigate the mechanism of Cu diffusion, it is necessary to adopt high resolution and small beam size grazing incidence X-ray diffraction (GIXRD) generated by synchrotron radiation.

Keywords – Bi_2Te_3, thin film, thermoelectric, Cu, GIXRD