

Bi-Sb-Te 계 열전재료 섬유상 단결정의 기계적 강도 및 열전특성 (Mechanical Strength and Thermoelectric Properties of The Bi-Sb-Te Thermoelectric Fiber Crystal)

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0.75Sb₂Te₃+0.25Bi₂Se₃ 조성에 Se 이 1.75w/o 첨가된 열전재료를 고밀도 graphite mold 에 장입한 후 수평 Bridgman 방법을 이용하여 성장온도 562°C, Ar 분위기로 길이 10cm, 두께 2mm 의 섬유상 단결정을 성장시켰다. 성장된 방향은 [111]이며 결정표면은 금속 특유의 광택을 보였다. 섬유상 단결정의 전기전도도, Seebeck 계수 및 열전도도 등의 열전특성과 3 점 굽힘강도를 측정하여 bulk 단결정의 특성과 비교하였다.

Keywords: crystal growth, single crystal, seebeck coefficient, resistivity, 3-point bending strength

Optical Nanocomposite Films and Aerosol Deposition Method

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Nanocomposite metal-dielectric systems have been considered for their interesting color effects in decorative applications, their adjustable electrical conductivity, and their dielectric properties in RF application. The surface plasmon resonance (SPR) of nanocomposite metal-dielectric films, which is of great interest in biomedical and optical applications, refers to the optical excitation of surface plasmons or charge-density waves at the interface between a metal and a dielectric. Aerosol deposition method (ADM) has been attracting much attention for the fabrication of complex oxide films with a high deposition rate and a low process temperature. In the report, we demonstrate the first fabrication of novel Au/PZT nanocomposite thick films by ADM and their optical properties of SPR. Composite metal-dielectric powders are prepared from submicron particles of PZT and nano particles of gold (10-40 nm) with concentrations of below 1 w%. The Au/PZT nanocomposite films with thicknesses of 2-10 μ m by ADM were obtained with no cracks and good spatial distribution of the metal particles. Their SPR position shifts dramatically from 529 nm (as-deposited, dark red film) to 634 nm (annealed at 600°C /10 min, deep blue film) with increasing annealing temperature. It shows that this control of microstructure by annealing process allows one to select with high precision of the SPR band position by a size related shift. Moreover, we found that as-deposited nanocomposite films can show even enhanced SPR by changing a particle size of dielectric powder in ADM and SPR positions can be precisely tailored by adjusting a reflective index of dielectric matrix as well as a conductivity of nano sized metal.

Keywords: aerosol deposition method, nanocomposite, surface plasmon resonance