

High Figure of Merit Thermoelectric Materials: Ion Beam formation of Nanolayers of Quantum

D. ILA*, S. Budak, B. Zheng, R. L. Zimmerman, and C. Muntele

Center for Irradiation Materials,
Department of Physics, Alabama A & M University,
4900 Meridian Street
Normal, AL 35762-1447, USA

Abstract

We have used MeV ion beam to form Nanolayers of Nanocrystals of various materials within a selected host materials. The layered structure was produced by sequentially co-depositing host along with selected species and the host alone. We have observed that the Nanocrystals are formed along the direction of MeV Ion beam passage due to the electronic ionization of substrate. One system consist of Nanolayers (Quantum Well) of Nano-Crystals (Quantum Dots) to generate optical filters (OF) with variable window as well as highly efficient thermoelectric generators (TEG). To generate highly efficient TEG we had to enhance the electrically conductive as well as the thermal insulation and increase the Seebeck Coefficient. Some of the material systems we had to dope the nanolayers by keV implantation of selected species followed by MeV bombardment. In some selected materials systems we formed nanolayered structures by co-deposition followed by MeV bombardment to form Nanocrystals. We will present our finding on the dependence of the thermal conductivity (using 3ω technique), electrical conductivity (using Van der Pauw method), and the Seebeck coefficient as a function of ion bombardment fluence for several selected materials systems produced in house.

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* Corresponding author: D. ILA; Tel.: 256-372-5866; Fax: 256-372-5868; Email: ILA@CIM.AAMU.EDU