MAR12-2011-004282

Abstract for an Invited Paper
for the MAR12 Meeting of
the American Physical Society

Thermoelectric Transport in Bismuth Telluride Nanoplates, Semiconductor Nanowires, and Silicide Nanocomposites: Effects of Low Dimensionality, Surface States, Interface Structures, and Crystal Complexity

LI SHI, The University of Texas at Austin

This presentation will review recent measurement results of thermoelectric properties of individual bismuth telluride nanoplates, semiconductor nanowires, and silicide nanocomposites. In experiments with these realistic nanostructured materials, a number of factors influence the transport properties. For example, unintentional doping, interface roughness and impurities can often obscure the predicted effects of the low-dimensional electronic density of states and the protected surface states, the latter of which have been suggested for bismuth telluride and other thermoelectric materials, now also referred as topological insulators. Similarly, impurities and defects as well as contact thermal resistance can play an important role in phonon transport in nanostructures, making it nontrivial to quantify the actual effects of phonon-surface scattering and other intriguing low-dimensional phonon transport phenomena. Because of these experimental complications, diverse theoretical interpretations of experimental results have appeared in the literature, and will be discussed. Moreover, the effects of twin defects and crystal complexity on thermoelectric transport in nanostructures will be examined based on measurement results of III-V and silicide nanostructures.