

Thursday, March 26, 2009

4:00 pm

in Room 303 MAE-A

Energy Conservation and Role of Thermoelectric Materials and Devices

Vladimir Jovovic

The Ohio State University, Mechanical Engineering

Abstract

The rapid increase in energy consumption has devastating consequences to nature and humankind. This increase is driven by change in social behavior and economic standard in our country and abroad. Our most accessible source of “renewable” energy is the heat that we waste in conventional thermodynamic conversion processes, particularly in the transportation industry and in residential and commercial entities. This talk will introduce solid-state devices that can be used to recover part of that energy. It will describe fundamental and practical limitations of thermoelectric (TE) devices used for power generation as well as those in use for climate control and for remotely powered sensors.

In recent years, nanotechnologies have been used to double the efficiency of TE materials. We apply the lessons learned by developing nano-TE materials but now at the atomic level. In this talk I will outline how new materials are developed through electron and phonon engineering. In the case of electrons we use a resonance between thallium atoms and the valance band of PbTe (conventional TE material) to mimic the behavior of nano-wires. In the case of phonons, this is achieved in AgSbTe₂ using two electronic levels of antimony to scatter phonons thus reducing the thermal conductivity. This allows us to develop high energy density devices for premium energy generation, particularly suited for mobile devices, autonomous vehicles and sensors.

Biography

Vladimir Jovovic is a graduating Ph.D. student from The Ohio State University. His current research activities are in the area of development of new materials and devices for thermoelectric power generation and climate control. Among other awards he has received the Presidential Fellowship at the Ohio State University as recognition of his outstanding scholarship and research ability.

Refreshments served in 303 MAE-A beginning at 3:50 pm

