Department of Materials Science and Engineering

Iby and Aladar Fleischman Faculty of Engineering Tel Aviv University

הפקולטה להנדסה ע"ש איבי ואלדר פליישמן אוניברסיטת תל אביב

המחלקה למדע והנדסה של חומרים

You are cordially invited to attend this seminar to be held on

Tuesday, December 5th, 15:00

Room 206, Wolfson Mechanical Engineering Building

Toward Higher Thermoelectric Efficiency for Power Generation Applications

Prof. Yaniv Gelbstein

Department of Materials Engineering
Ben-Gurion University of the Negev Beer-Sheva

Thermoelectrics as a direct energy conversion method between heat and electricity is mainly used for electrical power generation and cooling applications.

A large variety of materials, such as intermetallic compounds (e.g. half-Heuslers), silicides and chalcogenides (e.g. PbTe and GeTe) have been investigated as thermoelectric materials due to high ZT values at different temperature ranges. Among these material classes, although currently showing lower ZTs, silicides and intermetallic compounds possess additional advantages due to improved mechanical properties, the ability to operate at higher temperatures and the potential for large scale commercialization, since they are composed of naturally abundant and less toxic elements.

Global trends for improving the thermoelectric efficiency via maximizing the ZT values include, electronic doping optimizations; generation of Functionally Graded Materials (FGMs) with an optimal maximal ZT envelope over a wide temperature range; and nanostructuring formation for reduction of the lattice thermal conductivity. Nanostructures generation can be achieved by nano-powdering using energetic ball-milling followed by a rapid consolidation method such as Spark Plasma Sintering (SPS). Yet, due to the demand for high stability characteristics, required for long operation periods at high temperatures, one approach for avoiding nano-features coarsening and thermoelectric properties degradation, is based on utilizing thermodynamically driven nanostructures, due to physical metallurgy based effects such as spinodal decomposition and nucleation and growth reactions.

All of the mentioned above general trends in thermoelectric will be discussed during the talk. A focus on the related activities in the department of Materials Engineering at BGU will be given.

Prof. Gelbstein serves since Aug. 2016 as the Head of the Department of Materials Engineering at Ben-Gurion University of the Negev (BGU), Beer-Sheva, Israel. Before he served as the Head of the Unit of Energy Engineering, also at BGU.

Prof. Gelbstein leads the laboratory of Thermoelectric Materials at BGU for more than 10 years, and focused on the development of various thermoelectric materials classes, including tellurides, half-Heuslers, silicides and more.

He published more than 80 scientific articles and book chapters, and gave 50 invited talks in scientific conferences, mostly in the field of thermoelectrics.