

## **Thermoelectric devices for electronic cooling applications**

Mona Zebarjadi

Mechanical Engineering Department, Rutgers University, Piscataway, NJ, USA

Thermoelectric coolers or Peltier coolers are used to pump heat in the opposite direction of the natural heat flux. These coolers have also been proposed for electronic cooling wherein the aim is to pump heat in the natural heat flux direction and from hot spots to the colder ambient temperature. In this talk we show that for such applications, one need to use thermoelectric materials with very large thermal conductivity and very large power factor instead of the traditionally used high ZT thermoelectric materials. We further show that with the known thermoelectric materials, the active cooling cannot compete with passive cooling and one needs to explore a new set of materials to provide a cooling solution better than a regular copper heat sink. We propose a set of materials and directions for exploring possible material candidates suitable for electronic cooling. Finally to achieve maximum cooling we propose to use thermoelectric elements as fins attached to copper blocks. This late geometry could enhance the cooling processes significantly.