

Mg₂Si-based Thermoelectric Materials for Energy Harvesting

Theodora Kyratsi

Department of Mechanical and Manufacturing Engineering, University of Cyprus, Nicosia, Cyprus

Recovery of “waste” energy is nowadays a challenge when energy is one of the most important global problems that we need to face. In the last decades interest in thermoelectric technology has experienced a dramatic rise due to its applications on such energy systems. Research on high temperature thermoelectric materials includes different systems such as PbTe-based, skutterudites, silicides, half-Heusler, Si&Ge-based for temperatures up to 1300K.

This presentation reviews our recent research activities on Mg₂(Si,Sn,Ge)-based compounds as very promising candidates for thermoelectric generators. This is an interesting family of materials due to their high ZT, ample availability of their constituent elements in nature, non-toxicity and low density. ZT of 1.4 at 800K was achieved on Si-rich compositions being the highest value reported in this system. Beyond the optimization of the materials composition, the development of a methodology for scalable synthesis as well as stability studies at high temperatures are part of our on-going work on the way to the development of thermoelectric modules. Moreover, high-ZT Mg₂(Si,Sn,Ge) was also successfully synthesized using Si that comes from PV industry wastes in an effort to explore the idea of recycling such wastes to the thermoelectric technology.