
DS 34: Invited Sands

Time: Thursday 14:15–15:00

Location: GER 38

Invited Talk DS 34.1 Thu 14:15 GER 38
Metal/Semiconductor Superlattices as Thermoelectric Metamaterials for Solid-State Energy Conversion — •TIMOTHY D SANDS — Purdue University, West Lafayette, IN, USA

Thermoelectric (TE) generators have been used in niche applications, such as deep-space probes, that demand a compact and robust source of electrical power. A significant improvement in efficiency will be necessary to expand the applications of thermoelectrics to waste heat generators for vehicles and energy-intensive industrial processes. As an alternative to conventional thermoelectric materials based on degen-

erate semiconductors, we have explored an approach based on nitride metal/semiconductor superlattices such as (Zr,W)N/ScN. The metal provides a source of electrons, a fraction of which have energies above the Schottky barrier introduced by the metal/semiconductor interface. The transport is thermionic, yielding a differential conductivity that is asymmetric with respect to the Fermi energy. The high concentration of interfaces in superlattices with nanoscale periods suppresses the cross-plane thermal conductivity to values as low as 1.8 W/m-K, enhancing the figure-of-merit. In this presentation, the progress towards high performance metal/semiconductor thermoelectric metamaterials will be reviewed and remaining challenges will be highlighted.