

Thermoelectric systems and applications

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Thermoelectricity enjoyed a revival during the last years due to new physical approaches like nanostructuring, phonon-glass-electron-crystal concept and introduction of resonant states into the thermoelectric materials in order to improve the thermoelectric figure of merit. The aim of the research is to obtain improved thermoelectric materials in order to improve existing applications and to make new application accessible.

Thermoelectric application fields can be subdivided into 3 areas:

1. Thermoelectric Generators to convert thermal heat flux directly into electricity,
2. Thermocouples to sense temperatures, and
3. Peltier-devices as solid-state heat pumps for temperature regulation and refrigeration.

In this tutorial the basic principles of these application fields will be presented and the design rules of thermoelectric modules and thermoelectric systems will be pointed out.