

Thermoelectric Materials

PERSPECTIVES: THERMOELECTRIC MATERIALS —

Smaller Is Cooler

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What are thermoelectric materials?

**Advantages of Thermoelectric Devices:
No moving parts, no greenhouse gases**

Figure 1

- Deep space probes
- Electronic circuitry
- Conversion of waste heat
- Refrigeration ?

What are the requirements of a high ZT? (= 3 needed; 0.9 current best)

**$ZT = S^2(\sigma)T / (\kappa)$; high electrical conduction,
low thermal conduction**

Electron crystals, phonon glasses

Thermoelectric Materials

Two classes of promising
thermoelectric materials

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Another promising class of
materials are filled skutterudites:

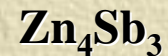
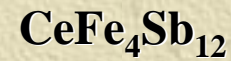


Figure 2

What are common structural features in thermoelectric materials?