# The Pursuit of Materials Research for Energy Conversion Applications

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## **Thermoelectric Devices and Applications**





http://www.ecofriend.com/thermoe lectricity-viable-source-cleanenergy-generation.html





http://www.waldeneffect.org/blog/Th ermoelectric\_power\_generation/



http://dison.en.alibaba.com/product/ 519986638210601760/2\_8\_C\_ther moelectric refrigeration.html

http://www.grin.com/en/doc/258082/methods-of-thermoelectric-enhancement-in-silicon-germanium-alloy-type-i

http://www.newscientist.com/article/d n17095-nuclear-fuel-for-spacecraftset-to-run-out-in-2018.html

### **Thermoelectric Applications for Automobiles**



### Thermoelectric (TE) Figure of Merit





S : Seebeck coefficient
σ : electrical conductivity
K: thermal conductivity
T : absolute temperature



G.S. Nolas, J.W. Sharp and H.J. Goldsmid, Thermoelectrics: Basics Principles and New Materials Developments, Springer-Verlag, Berlin, 2001

## 1-2-20 Family of Compounds







UW<sub>2</sub>Al<sub>20</sub>





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## Thermoelectric Properties of $YbT_2Zn_{20}$ (T = Co, Rh, Ir)



T (K)



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