CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
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Project Number
S0902

Project Title
Energy Harvesting: Micro Thermoelectric Generator

Abstract

Objectives/Goals
Heat generated by equipment such as car engine etc. is often wasted into the environment. This experiment was to capture wasted heat and converting it into electricity to power a light emitting diode (LED). A miniature thermoelectric generator was created based on Seebeck # Peltier effect. The hot and the cold junction temperatures and the measured terminal voltages are used to calculate the Seebeck coefficient to prove this experiment.

Methods/Materials
Utilizing a commercial Peltier module of size 1.5" x 1.5", heat sinks, and an integrated circuit, a miro-thermoelectric generator was created to capture heat and convert it into small electrical energy enough to light up a LED.
The idea is based on Seebeck-Peltier's equation V= A*(Th-Tc), where A is the Seebeck coefficient, Th is the hot side temperature, and Tc is the cold side temperature. Data was taken to verify the Seebeck Coefficient.

Results
1) The voltage potential produced by a Peltier module, when being subjected to a hot surface and cold surface, can be further boosted up by using an electronic multiplier circuit to produce a larger voltage
2) The thermoelectric generator can produce 9mW to 16mW depending on how well the system is coupled to the heat source to power a LED
3) In this experiment, the objects that were used to help light up the LED lights were a heater, and a blow dryer (hot and warm temperatures). The heat blower made enough voltage to turn the LED since it requires at least 3 V and 1mA # 3mA to operate.
4) An electronic multiplier is necessary to boost the voltage to about 5V

Conclusions/Discussion
1) Reading temperatures and voltages by eyes (human errors)
2) Challenge remains in separating the hot and cool side of the generator
3) will there be any other ways to hide the cool side better?
4) By parallel many of these units, more power can be produced

Summary Statement
Harvesting wasted heat energy into useful electrical energy to power small electronic devices.

Help Received
Help received from my Dad to wire the board and buy components. Dad also helps getting the multiplier to work. Use borrowed equipments from Uncle.