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Design and Development of a Seebeck Coefficient Measurement System

Numerous processes in current society generate substantial waste heat . The use of thermoelectric (TE) materials, a unique group of materials capable of directly converting a temperature difference to electrical energy, is one such way to harness this underutilized energy source. Thermoelectric materials are solid-state devices with no mechanical moving parts and, thus, are completely silent and available in very small to large configurations for modularity in a wide range of heat recovery applications. The extent with which TE's convert temperature into voltage is characterized by the materials Seebeck Coefficient which can allow for predictions of device efficiency. The objective of this project was to design and build a Seebeck Coefficient measurement system for diced (~ 2 mm^3) ceramic semi-conducting thermoelectric materials that represents a significant departure from measuring simple metal wires. The system will be integrated with Agilent Benchlink Data Logger program in order to record temperature differences and voltage differences. With this data, the optimal temperature difference to produce the maximum output voltage can be determined for the material. This measurement system will be used in later research in order to determine the Seebeck Coefficient of compound semiconductors fabricated through the use of a directional solidification furnace.