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Development of a power-on-demand thermoelectric mobile phone charger

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With the ever-increasing demand for energy and fast depleting fossil fuel reserves, it is imperative to develop technology to improve the energy efficiency of existing systems and to develop novel renewable energy sources. Harvesting waste heat dissipated from industrial applications, automobiles, and other power conversion applications, and improving renewable energy sources has become an important area of research. Thermoelectric generators directly convert heat energy into electrical energy using the *Seebeck* effect. Thermoelectric generators (TEGs) have p-type and n-type thermoelectric elements connected thermally in parallel and electrically in series. When a temperature gradient across the two sides of a TEG (SP1848 SA 27145 module) is maintained, an electric current is generated, providing the potential to utilize this for power generation. TEGs are solid-state, reliable, noiseless, lightweight, and without moving parts. TEGs can produce electric power on demand, using any type of heat source, be it solar energy or biofuel, or waste heat from a kiln or automobile engine, or even body heat, making them versatile devices. Aprototype of a thermoelectric mobile phone charger is described here. An oil lamp placed in a metal container provides the heat to the TEG and the cold side is attached to a heat sink that is immersed in a water container. Special design was introduced to avoid the surface of the TEG getting over-heated. When temperatures 88 °C on the hot side and 30 °C on the cold side were maintained, the TEG produced an open-circuit voltage of 1.164 V and a current of 296 mA. A DC converter connected to the generator increased the thermoelectric voltage to 5.23 V and maintained the current at 255 mA, providing sufficient power to charge a mobile phone. The output power was 1.33 W. Further research is being conducted to improve the efficiency and to develop small scale and affordable thermoelectric devices.

Keywords: *renewable energy, thermoelectric generators, seebeck effect, efficiency*