A Novel Application of the Thermoelectric Effect in Mobile Devices

Johnson, Davis
Murray, Parker

In recent years, there has been an upsurge in mobile device use. In addition to this, there has been a relative stall in the development of battery technology in comparison to the development of processors that consume incredible amounts of energy, while producing great amounts of heat. As such the need has arisen for a way to cheaply extend battery life and provide adequate cooling to maintain optimal operating temperatures in mobile devices. A Motorola Atrix smartphone was modified to expand the space in the back casing and expose the motherboard of the device. A Peltier module was then mounted inside the device, with its electrical leads running into the microUSB port on the side of the phone. To dissipate the heat (a necessary step for power generation) a pyrolytic graphite sheet was used to draw heat away from the processor. This was connected to a graphene heat sink. The heat sink was created by exposing a sonicated graphite oxide solution to a DVD drive laser, producing graphene. The phone was then allowed to idle, and battery life was tested with and without the Peltier module connected. On average these modifications saw a 40.9% increase in battery life, from 26 hours to 44 hours. This data demonstrates that by utilizing the thermoelectric effect, a significant amount of waste heat can be reclaimed as extra battery life for today's mobile devices.