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Energy Storage and Generation from Thermopower Waves JOEL ABRAHAMSON, SAYALEE MAHAJAN, WONJOON CHOI, NICOLE SCHONENBACH, JUNGSIK PARK, MICHAEL WALSH, JARED FORMAN, JAE-HEE HAN, Massachusetts Institute of Technology, KOUROSH KALANTAR-ZADEH, RMIT University, MICHAEL STRANO, Massachusetts Institute of Technology — We have demonstrated through simulation and experiment that the non-linear coupling between an exothermic chemical reaction in a fuel and a nanowire or nanotube with large axial heat conduction accelerates the thermal reaction wave along the nano-conduit. The thermal conduit rapidly transports energy to unreacted fuel regions, and the reaction wave induces a concomitant thermopower wave of high power density, producing electrical current in the same direction. At up to 14 W/g, this can be substantially larger than the power density offered by current micro-scale power sources (e.g. fuel cells, batteries) and even about seven times greater than that of commercial Li-ion batteries. MEMS devices and wireless sensor networks would benefit from such high power density sources to enable functions such as communications and acceleration hampered by present power sources.

Joel Abrahamson
Massachusetts Institute of Technology

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