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Optimization of thermoelectric performance in semiconducting polymers for understanding charge transport and flexible thermoelectric applications ANNE GLAUDELL, MICHAEL CHABINYC, University of California Santa Barbara — Organic electronic materials have been widely considered for a variety of energy conversion applications, from photovoltaics to LEDs. Only very recently have organic materials been considered for thermoelectric applications - converting between temperature gradients and electrical potential. The intrinsic disorder in semiconducting polymers leads to an inherently low thermal conductivity, a key parameter in thermoelectric performance. The ability to solution deposit on flexible substrates opens up niche applications including personal cooling and conformal devices. Here work is presented on the electrical conductivity and thermopower of thin film semiconducting polymers, including P3HT and PBTTT-C_{14}. Thermoelectric properties are explored over a wide range of conductivities, from nearly insulating to beyond 100 S/cm, enabled by employing different doping mechanisms, including molecular charge-transfer doping with F4TCNQ and vapor doping with a fluoroalkyl trichlorosilane (FTS). Temperature-dependent measurements suggest competing charge transport mechanisms, likely due to the mixed ordered/disordered character of these polymers. These results show promise for organic materials for thermoelectric applications, and recent results on thin film devices will also be presented.

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