Abstract Submitted
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Thermoelectric Transport in Organic Semiconductors Using Polymerized Ionic Liquid Gate Dielectrics[1] ELAYNE THOMAS, BHOOSHAN POPERE, HAIYU FANG, MICHAEL CHABINYC, RACHEL SEGALMAN, University of California - Santa Barbara — Thermoelectric materials are able to convert a temperature gradient into usable electricity via the Seebeck effect. This phenomenon is directly related to the material's Seebeck coefficient, electrical conductivity, and electron (or hole) mobility, all of which depend on carrier concentration. Carrier concentration is difficult to determine in many organic materials, which prevents a fundamental understanding of their thermoelectric charge transport mechanisms. In this work, we have utilized a field effect transistor (FET) geometry to directly modulate the carrier concentration of a p-type semiconducting polymer via gating. To allow for controlled doping at high carrier concentrations, we employed a high-capacitance ($1\mu F/cm^2$) polymerized ionic liquid (PIL) as the gate dielectric. PILs contain one ion covalently bonded to the polymer backbone and one mobile ion. We see that doping through the field effect yields power factors similar to more traditional chemical doping methods with the advantage of stable and well-controlled carrier concentration modulation. Our studies demonstrate that gating with PILs offers a platform to investigate thermoelectric transport in organic semiconductors to guide further development in these complex systems.

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