MS&E SPRING COLLOQUIUM 2016

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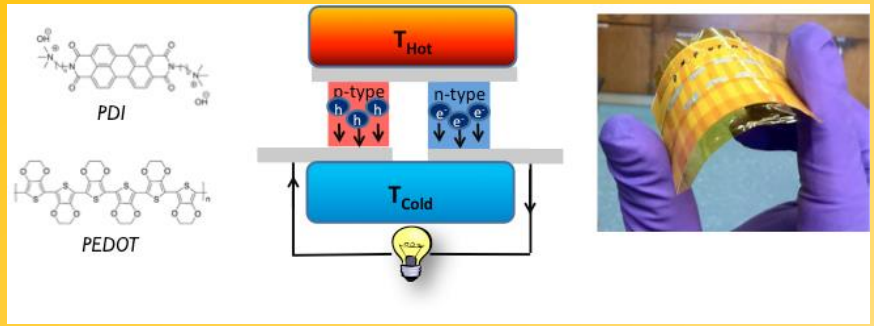
Friday, April 15
11:00 a.m.
Room 214 S. W. Mudd



Designing Polymer and Hybrid Thermoelectrics

Thermoelectric materials for energy generation have several advantages over conventional power cycles including lack of moving parts, silent operation, miniaturizability, and CO2 free conversion of heat to electricity. Excellent thermoelectric efficiency requires a combination of high thermopower (S, V/K), high electrical conductivity (σ, S/cm), and low thermal conductivity (κ, W/mK). To date the best materials available have been inorganic compounds with relatively low earth abundance and highly complex, vacuum processing routes (and hence greater expense), such as Bi2Te3. Molecular materials and hybrid organic-inorganics bring the promise of inexpensive, solution processible, mechanically durable devices. While highly conductive polymers are now commonplace, they generally demonstrate low thermopower. Our work on molecular scale junctions indicates that nanostructuring of organics allows them to act as thermionic filters between inorganic junctions which can lead to enhanced thermoelectric properties. We have taken inspiration from this fundamental understanding to design new solution processible material systems with a thermoelectric figure of merit within an order of magnitude of the Bi2Te3. In this talk, I will discuss both the use of thermoelectric measurements to gain insight to organic and hybrid materials and how this insight translates to design principles for thermoelectrics.

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