Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Power factor enhancement in solution-processed organic n-type thermoelectric materials through side chain design BORIS RUSS, Dept of Chemical Engineering, UC Berkeley, MAXWELL J. ROBB, FULVIO G. BRUNETTI, LEVI MILLER, SHRAYESH PATEL, Dept. of Materials Science, UC Santa Barbara, VICTOR HO, Dept of Chemical Engineering, UC Berkeley, JEFFREY J. URBAN, Lawrence Berkeley National Laboratory, MICHAEL L. CHABINYC, CRAIG J. HAWKER, Dept. of Materials Science, UC Santa Barbara, RACHEL A. SEGALMAN, Dept of Chemical Engineering, UC Berkeley — Building efficient organic thermoelectric architectures requires complementary p-type (hole transporting) and n-type (electron transporting) components. While several high performance hole-transporting polymers have been developed, the design of n-type organics has proven challenging, and thermoelectric studies of organic n-type systems are scarce. We investigate the properties of a series of charged perylene diimide (PDI) derivatives. Charged side chains in these materials enable both water solubility and self-doping. We show that changing the length of the alkyl spacer between the charged end groups and the PDI core dramatically improves thin film thermoelectric properties. The top derivatives in our study demonstrated the highest power factor reported for n-type solution-processed films. By complementing thermoelectric characterization of these variants with insight on the electronic and structural property changes from optical spectroscopy, EPR, and GIWAXS experiments, our findings shape a promising molecular design strategy for future enhancements in thermoelectric performance.

Boris Russ
Dept of Chemical Engineering, UC Berkeley

Date submitted: 12 Nov 2013 Electronic form version 1.4