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**Thermopower Measurements of Highly Conducting Single-Molecule Devices** JONATHAN R. WIDAWSKY, WENBO CHEN, HECTOR VAZQUEZ, TAEKYEONG KIM, MARK S. HYBERTSEN, RONALD BRESLOW, LATHA VENKATARAMAN, Columbia University and CFN, Brookhaven National Laboratory — We measure the conductance ($G$) and thermopower ($S$) of highly conducting single-molecule junctions with Au electrodes. The junctions are formed and measured using a scanning tunneling microscope-based break-junction technique. The target molecules are synthesized with $SnMe_3$ terminations that cleave off *in situ*, allowing for the formation of direct Au-C covalent bonds to the electrodes[1,2]. We compare the conductance and thermopower for two families of molecules: pi-conjugated polyphenyls, which have a high conductance and thermopower, and sigma-bonded alkyl systems, where we observe a significant thermopower despite the low conductance. For these measurements, we use the most probable thermopower to determine a power factor, $GS^2$, for each molecular junction studied. Our results show that the molecular thermopower increases systematically and non-linearly with molecular length and also that the power factor is exceptionally large for the case of the biphenyl. [1] Z. L. Cheng, R. Skouta, H. Vazquez *et al.*, Nat. Nano. **6**, 353 (2011). [2] W. Chen, J. R. Widawsky, H. Vázquez *et al.*, J. Am. Chem. Soc. **133**, 17160 (2011).

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