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Thermoelectric Properties of Conjugated Polyelectrolytes CYNTHIA CHEN, University of California, Berkeley, CHENG-KANG MAI, MICHAEL CHABINYC, University of California, Santa Barbara, JEFFREY URBAN, Lawrence Berkeley National Laboratory, GUILLERMO BAZAN, University of California, Santa Barbara, RACHEL SEGALMAN, University of California, Berkeley — Conjugated polymers are emerging as promising thermoelectric materials due to their solution processability, low thermal conductivity, and tunability of electrical properties via chemical modification. For the first time, conjugated polyelectrolytes, which are conjugated polymers with charged side chains, are being explored for thermoelectric applications. Charged side chains may be able to dope directly conjugated polymers by stabilizing the radical cations on the π-conjugated backbone. In this work, we investigate the thermoelectric properties of a novel narrow band gap conjugated polyelectrolyte with anionic side chains, poly[2,6-(4,4-bis-potassiumbutanylsulfonate-4H-cyclopenta-[2,1-b;3,4-b']-dithiophene)-alt-4,7-(2,1,3-benzothiadiazole)] (CPE-K). We show that doping CPE-K with hydrochloric acid can raise electrical conductivity without significantly changing Seebeck coefficient, resulting in an overall increase in power factor and an indication of how molecular design can be used to increase thermoelectric efficiency. Our results also shed some light on the role of charged side chains and the mechanism of doping in conjugated polyelectrolytes, which is different from that of doping in inorganic materials.

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