Conjugated polymer films for flexible thermoelectric generator

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Conjugated polymers (CPs) for thermal energy harvesting are promising because of their high electrical conductivity with low thermal conductivity. In our group, CP films from heterocyclic compounds including thiophenes have been explored for a flexible TE generator. Since the CP films were obtained by solution process, the electrical properties of CP film were optimized by solution composition, which controlled the microstructure of polymers when processed as a thin-film. A flexible TE generator based on a CP film exhibited a large power factor and could be used to generate electricity at 2 ~ 10 K temperature gradient. The TE films were further explored as a flexible p-n type TE module and also photo-thermo-electric harvester, because their absorption energy was easily controlled by the degree of doping. Efficient near-IR photothermal effect and heat to electric conversion have been realized in CP films that could benefit in exploiting hybrid energy harvesters.