ABSTRACT

Printable Thermoelectrics for Low Temperature Grade Energy Harvesting

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Organic thermoelectric materials allow a facile, scalable, and reproducible method to fabricate efficient printable TE devices using both chemical and physical doping strategies. TE device can be manufactured using spray coating, blade coating or other printing process, enabling to produce thick, lightweight, flexible, and wearable devices. Interestingly, compositing the organic semiconductor and the conductive filler can lead to a simultaneous increase in the Seebeck coefficient and electrical conductivity.
The integration of polymers with low dimensional fillers is a facile and efficient approach to improve the TE properties of polymers. The fillers are usually carbon-based materials or inorganic-based materials.
The morphological characterization shows that despite common approaches, including for instance the physical blending of CNTs and P3HT into a solvent, the deposition of the polymer can leave the aligned morphology of CNT unaltered. This can be exploited for improving the electrical properties of the composite.
A promising direction to further improve the TE properties of both p and n type materials, is the investigation of different additives, treatments and doping methods. For example, to keep the morphology intact, the postprocessing approaches such as the introduction of the dopant from the vapor phase or immersion in the dopant solution could also be used as alternative to improve the electrical properties of the organic semiconductor.
These organic composites also show bending stability at different angles and remarkable environmental stability at ambient conditions, confirming their suitability for applications in portable and flexible devices.

References

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