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Correlating thermoelectric performance with nanostructure of conductive polymer blended with lignin

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Developing efficient, sustainable thermoelectric (TE) devices to harness waste heat is challenging due to the reliance on rare elements in conventional materials. Recently, conducting polymers, particularly Poly(3,4-methylenedioxy thiophene): poly(styrene sulfonate) (PEDOT: PSS) blends, have shown promising TE performance improvements [1]. However, PEDOT has limitations, such as sensitivity to humidity and electrical and microstructural irregularities. Blending lignin with conducting polymers can address these issues [2,3]. Lignin, a readily available plant resource, is a potential bio-based dopant and hole transport material. Nevertheless, the thermoelectric properties of PEDOT blended with lignin remain unexplored. We have optimized an aqueous PEDOT: lignosulphonate (LS) solution and deposited thin films through spin coating. Our study includes UV-Vis spectroscopy and grazing-incidence wide-angle X-ray scattering to analyze structural changes and doping effects on thermoelectric properties. Additionally, we will report on electrical resistivity and TE measurements. These investigations aim to determine if sustainable lignosulphonate can replace costly PSS as a dopant and dispersant for eco-friendly energy generation.

References
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