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# Thermal Diffusion of Photovoltaic Organic Semiconductors Determined by Scanning Photothermal Deflection Technique

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**Abstract :** Thermal diffusivity is an important quantity in heat conduction. It measures the rate of heat transfer from the hot side to the cold side of a material. In solid-state materials, thermal diffusivity reveals information related to morphologies and solid quality, as thermal diffusivity can be affected by microstructures. However, thermal diffusivity studies on organic semiconductors are very limited. In this study, scanning photothermal deflection (SPD) technique is used to study the thermal diffusivities of different classes of semiconducting polymers. The reliability of the technique was confirmed by crossing-checking our SPD derived experimental values of different reference materials with their known diffusivities from the literature. To show that thermal diffusivity determination is a potential tool for revealing microscopic properties of organic photovoltaic semiconductors, SPD measurements were applied to various organic semiconducting films with different crystallinities. It is observed that organic photovoltaic semiconductors possess low thermal diffusivity, with values in the range of 0.3mm$^2$/s to 1mm$^2$/s. It is also discovered that polymeric photovoltaic semiconductors with greater molecular planarity, stronger stacking and higher crystallinity would possess greater thermal diffusivities. Correlations between thermal, charge transport properties will be discussed.

**Keywords :** polymer crystallinity, photovoltaic organic semiconductors, photothermal deflection technique, thermal diffusion
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