

Spontaneous Orientation Polarization in Organic Semiconductors: From Fundamentals to Device Applications

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Molecular orientation in organic thin films is one of the most important factors in controlling the performance of organic electronic devices. Spontaneous orientation polarization (SOP) is a phenomenon that originates from molecular orientation control and allows the fabrication of thin films exhibiting spontaneous polarization without the need for any additional polarization process. SOP formation is attributed to the inclination of the permanent dipole moments of vacuum-deposited polar molecules in glassy films^[1].

Our group has developed molecular design principles for the control of SOP. Specifically, through the tuning of intermolecular interactions during vacuum deposition, we controlled the spontaneous head-to-tail orientation of polar molecules along the film-growth direction, thereby achieving both enhanced SOP and polarity control. Furthermore, we have demonstrated that controlling the properties of organic–organic interfaces using SOP can improve the performance of organic thin-film electronic devices, including organic light-emitting diodes (OLEDs) and organic photovoltaics (OPVs)^[2–6].

References:

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