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特邀报告

液晶材料在有机光伏器件中的应用研究进展

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摘要：液晶材料应用于有机半导体器件是近年该领域的研究热点之一。文章就液晶材料的半导体性质以及在有机光伏器件中的应用进行文献调研和述评。介绍了有机太阳能电池的基本原理、器件结构和液晶基本知识。分析了液晶分子自身作为给体或受体材料的研究现状,同时,对液晶材料作为添加剂在有机光伏器件中的应用进行了调查。结论认为,基于有机成分的液晶分子由于自身的有序性,在有机半导体器件制备过程中充当活性材料,有利于生成的激子解离和载流子的输运。作为添加剂,液晶分子参与诱导活性材料有序结晶,改善异质结界面及微观结构,同样提高激子解离效率和载流子输运能力。两者都能够有效提高有机光伏器件的转换效率。最后,对基于液晶材料的有机光伏器件的研究趋势进行了展望。

关键词：太阳能电池 液晶 有序性 诱导结晶 有机半导体

Research Progress of Liquid Crystal Material Applied in Organic Photovoltaic Devices

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Abstract: Liquid crystal (LC) material used in organic semiconductor device is one of the areas of research focuses in recent years. This paper reports and reviews the semiconductor properties and applications in organic photovoltaic (OPV) of LC materials. The principles and device structure of OPV, and the basic knowledge of LCs are introduced. The research statuses of LC materials used as electron donor or acceptor in organic semiconductor devices are discussed. Meanwhile, as a semiconductor doping, the application of LC materials in OPV is also investigated. In conclusion, the ordered LC molecule is conducive to exciton dissociation and carrier transport as LCs is used as active layer material in OPV. When LC material is mixed into the active material of OPV, LC molecules will play a positive role in the crystallization process of the active layer. The doping of LCs in active layer can ameliorate the heterojunction interface and microstructure, and hence improve the efficiency of exciton dissociation and carrier transport capability. Both of the two aspects can effectively improve the power conversion efficiency of OPV. Finally, the development tendency in the future of OPV based on the LC material is prospected.

Keywords: solar cell liquid crystal order induced crystallization organic semiconductor

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