Insight into the synthesis, design and processing of narrow band gap organic semiconducting polymers for solar cell fabrication

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Abstract

High charge separation efficiency combined with the reduced fabrication costs associated with solution processing (printing and coating) and the potential for implementation on flexible substrates make “plastic” solar cells a compelling option for tomorrow’s photovoltaics. The control the donor/acceptor morphology in bulk heterojunction materials as required for achieving high power conversion efficiency have is therefore of primary concern. We showed that by incorporating a few volume percent of high boiling point additive, the power conversion efficiency of photovoltaic cells (AM 1.5 conditions) is increased from 2.8% to 5.5% [1]. Subsequent efforts centered on understanding the mechanism of action of the additives and this will be discussed in some detail [2,3,4]. More recently, the improved synthesis of polymers has been studied, in particular those backbone systems that lead to aggregation in solution and high performance devices. We will present polymerization procedures that lead to high molecular weight product in short reaction times and involve simple purification protocols. Emerging structure/function relationships will be examined, as well as those polymer systems that allow fabrication of devices that have power conversion efficiencies approaching 6 %.

References

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