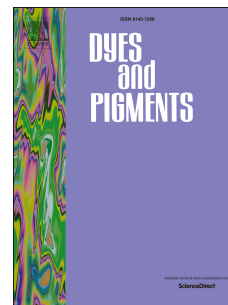


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Growth of Thiophene Based Oligomers Using Stille and Direct Arylation Methods for Optoelectronic Applications

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ABSTRACT: Palladium catalyzed Stille coupling reactions are extensively used for the preparation of functionalised thiophene based polymers. In addition, polycondensation via direct C-H arylation produces alternating copolymers in moderate yields. In the present work, we report the synthesis and optoelectronic properties of thiophene based compounds having rigid cycloalkanone and a novel hexhydro-2*H*-indazole spacers in between. X-ray diffraction analysis shows the semi-crystalline nature of the synthesized materials with extensive side chain crystallinity. Band-gap energy of the synthesized materials has been obtained experimentally via optical and electrochemical methods and theoretically via computational studies. Open aperture Z-Scan results confirm the competence of these materials as optical limiters (NLO) while the photoluminescence emission characteristics and Schottky diode characteristics indicate their application prospects in Polymer Light Emitting Diodes (PLEDs). Polymers having hexhydro-2*H*-indazole spacers appear to be promising candidates for optoelectronic applications.

INTRODUCTION

Over the past few decades, great progress has been made in the field of the synthesis of bisbenzylidene cycloalkanones. These compounds are extensively studied owing to their interesting biological activity as well as intriguing material properties.^{1,2,3} Besides these, studies on heterocyclic ring systems namely thiophenes with cycloalkanone ring spacers have also been pursued. Thiophenes are of considerable interest due to their numerous and interesting properties ~~and~~ as monomers, oligomers and conducting polymers. Incorporation of rigid spacers into the thiophene backbone is anticipated to offer several distinct advantages. The resulting material can be extended to afford a more planar conformation through diminished steric effects so that a maximum degree of delocalization of π electrons is achieved. Owing to their unique electrical and optical properties, π conjugated materials are considered to be quite promising, and they have been widely applied in optoelectronic devices⁴⁻⁸ such as organic thin film solar cells, light emitting diodes, and electrochromic devices.⁶⁻¹⁰ Recently, considerable research effort has been concentrated on the synthesis of polyketones using Friedel-Crafts

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