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Self-Assembly Layer of Poly(*p*-phenylene vinylene) Modified with Long Alkyl Chains

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Extended Abstract

The π-conjugated polymers are particular interest because they are potential materials for several applications such as organic light-emitting diodes (OLEDs) or organic photovoltaic solar cells (OPVs). One of the promising conjugated polymers, but not very popular such as polyaniline or polypyrolle, is poly(phenelene vinylene) (PPV). The main aim of research is synthesis of novel derivatives of *p*-PPV materials, which could self-assemble on the Indium Tin Oxide (ITO) surface. The new materials should have more ordered structure with higher crystallinity degree, thereby should acquire better electrochemical, spectroscopic and photochemical properties.

p-PPV is one of the best donor materials in organic solar cells and it has unique physical properties, such as good conductivity, low cost of production, high mechanical strength and flexibility. PPV is almost insoluble polymer, which hinders its processing. To ensure solubility long alkyl or alkoxy chains could be incorporated into the phenylene ring before polymerization. Also, the significant drawback of polymers is its tendency to aggregation and tendency to "clutter" the polymer chain [1]. It affects the disturbance of its polymer structure and deterioration of conductive properties. The long alkyl side chains are commonly introduced onto polymer backbone to improve its ordered polymer structure. Beside this, the side chains also have significant impact on the morphology of conjugated polymers organized on the surface, and consequently it determines its optical and electrical properties.

PPV with long alkyl chains containing 9, 12, 15 and 18 atom of carbons were synthesized using Gilch route with mild polymerization conditions [2]. Understanding the processes leading to the formation of conjugated materials with unusual physico-optical properties, requires multidisciplinary research, combining experimental methods together with the theoretical. For the successful application of these materials, their structure, physicochemical and physico-optical properties after their polymerization and interaction between the different nanostructures have to be well understood. The physicochemical properties of obtained new materials are determined with different optical and electrochemical techniques, such as spectroscopic methods (FTIR with MCT, ^{1}H NMR, ^{13}C NMR, Raman), microscopic (AFM and SEM), thermogravimetric (TGA), scanning calorimetric analysis (DSC), electrochemical (CV, DPV, EIS) and optical (UV-Vis-NIR spectrophotometry) methods. The final stage will focused on the construction of OPV solar cell – standard and inverted.

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References

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