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Morphological and physicochemical properties of dip-coated poly {(2,5-diyl pyrrole) [4-nitrobenzylidène]} (PPNB) thin films: towards photovoltaic applications

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Type de publication	Article de revue
Auteur	Mouchaal, Y [1], Gherras, H [2], Reguig, A B [3], Hachemaoui, A [4], Yahiaoui, A [5], Makha, Mohammed [6], Khelil, A [7], Bernède, Jean Christian [8]
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Type	Article scientifique dans une revue à comité de lecture
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Résumé en anglais	A new material: conjugated poly {(2,5-diyl pyrrole) [4-nitrobenzylidène]}, that we called (PPNB), has been synthesized and characterized. The cyclic voltammetry has been used in order to estimate first oxidation (E_p) and reduction (E_n) potentials of our polymer. These values have been assigned, respectively, to the position of the highest occupied molecular orbital (HOMO) and the lowest unoccupied molecular orbital (LUMO) and determination of the energy band gap which have been estimated to be 6.16, 3.89 and 2.27 eV respectively. Energy levels values of the HOMO and LUMO of the PPNB polymeric donor material were evaluated and the results are compatible with an electron transfer to C_{60} within an eventual junction, such values show that PPNB could be probed for applications in organic solar cells as donor material. PPNB Thin films have been deposited by dip-coating technique from Dichloromethane solvent with different polymer concentrations, and a dipping speed of 3.0 cm/min. For morphological characterization of the films scanning electron microscopy (SEM) was carried out. The samples, when observed by SEM, reveals that the films deposited are less dense, uniform. Cross-sectional SEM micrographs PPNB films show that thickness of the layers is homogeneous and has value of 35–40 nm. Optical characteristics of the polymer thin films were studied using UV-vis spectroscopy; absorption of wide range of wavelengths from 350 to 700 nm was observed. The optical band gap energy ranges between 1.9 eV and 1.94 eV. Based on these analyzes we realized heterojunction organic solar cells with the structure: ITO/Au/PPNB/C60/BCP/Al, the cells had a photovoltaique effect after J-V measuring, however the efficiency of photo generation under AM1.5 illumination was weak (about 0.02%) and needs to be improved.
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