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Ultra-thin poly(3-hexylthiophene) films from the air/water interface to solid substrates

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Poly(3-hexylthiophene) (P3HT) is a regioregular conducting polymer widely used in the manufacture of field-effect transistors and photovoltaic cells [1,2]. Device performance strongly depends on the organization of the polymer, which is significantly influenced by the deposition method. Classical deposition techniques as drop casting or spin-coating lead to heterogeneous materials. We formed highly organized and homogeneous P3HT films at the air/water interface through the Langmuir technique, then transferred them onto solid substrates. Employing Grazing Incidence X-ray Scattering, X-ray Reflectivity, and X-ray Fluorescence, we extensively analyzed the structural properties of the layers both at the air/water interface and following deposition onto solid substrates. [3]. The effect of doping by F4TCNQ co-deposition on the structure was also determined. These results were compared with the optical properties and conductivity measurements [4].

[1] X. Ji, A. El Haitami, F. Sorba, S. Rosset, G. T.M. Nguyen, C. Plesse, F. Vidal, H. R. Shea, S. Cantin ; Sensors and Actuators B Chemical, 2018, 261, 135–143.

[2] K. S. Ahn, H. Jo, J. B. Kim, I. Seo, H. H. Lee, D. R. Lee; ACS Appl. Mater. Interfaces, 2020, 12, 1142–1150.

[3] H. Fernandez, A. El Haitami, A. Hemmerle, C. Shen, P. Jordt, R. P. Giri, P. Fontaine, S. Cantin; Polymer, 2024, 294, 126719.

[4] H. Fernandez, A. El Haitami, S. Spagnoli, P. Fontaine, S. Cantin, In preparation.

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Thin films and interfaces in soft matter and materials science

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