



# Dependence of Crystallite Formation and Preferential Backbone Orientations on the Side Chain Pattern in PBDTTPD Polymers

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Auteur	Labban, Abdulrahman El [1], Warnan, Julien [2], Cabanetos, Clément [3], Ratel, Olivier [4], Tassone, Christopher [5], Toney, Michael F [6], Beaujuge, Pierre M [7]
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Mots-clés	backbone orientation [8], benzo[1,2- <i>b</i> :4,5- <i>b'</i> ]dithiophene [9], polymer crystallite [10], side chain [11], thieno[3,4- <i>c</i> ]pyrrole-4,6-dione [12], $\pi$ -conjugated polymers [13]
Résumé en anglais	<p>Alkyl substituents appended to the <math>\pi</math>-conjugated main chain account for the solution-processability and film-forming properties of most <math>\pi</math>-conjugated polymers for organic electronic device applications, including field-effect transistors (FETs) and bulk-heterojunction (BHJ) solar cells. Beyond film-forming properties, recent work has emphasized the determining role that side-chain substituents play on polymer self-assembly and thin-film nanostructural order, and, in turn, on device performance. However, the factors that determine polymer crystallite orientation in thin-films, implying preferential backbone orientation relative to the device substrate, are a matter of some debate, and these structural changes remain difficult to anticipate. In this report, we show how systematic changes in the side-chain pattern of poly(benzo[1,2-<i>b</i>:4,5-<i>b'</i>]dithiophene-<i>alt</i>-thieno[3,4-<i>c</i>]pyrrole-4,6-dione) (PBDTTPD) polymers can (i) influence the propensity of the polymer to order in the <math>\pi</math>-stacking direction, and (ii) direct the preferential orientation of the polymer crystallites in thin films (e.g., “face-on” vs “edge-on”). Oriented crystallites, specifically crystallites that are well-ordered in the <math>\pi</math>-stacking direction, are believed to be a key contributor to improved thin-film device performance in both FETs and BHJ solar cells.</p>
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