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Comparing the Device Physics, Dynamics and Morphology of Polymer Solar Cells Employing Conventional PCBM and Non-Fullerene Polymer Acceptor N2200

Jianguo Yuan<sup>a\*</sup>, Wenping Guo<sup>b</sup>, Yuxin Xia<sup>c</sup>, Michael J. Ford<sup>d</sup>, Feng Jin<sup>b</sup>, Dongyang Liu<sup>a</sup>, Haibin Zhao<sup>b\*</sup>, Olle Inganäs<sup>c</sup>, Guillermo C. Bazan<sup>d</sup>, Wanli Ma<sup>a\*</sup>

<sup>a</sup>Institute of Functional Nano & Soft Materials (FUNSOM), Jiangsu Key Laboratory for Carbon-Based Functional Materials and Devices, Soochow University

<sup>b</sup>Shanghai Ultra-precision Optical Manufacturing Engineering Research Center and Key Laboratory of Micro and Nano Photonic Structures (Ministry of Education), Department of Optical Science and Engineering, Fudan University

<sup>c</sup>Biomolecular and Organic Electronics, IFM, Linköping University

<sup>d</sup>Center for Polymers and Organic Solids, Departments of Chemistry and Biochemistry, University of California, Santa Barbara

jyyuan@suda.edu.cn

hbzhao@fudan.edu.cn

wlma@suda.edu.cn

\*Corresponding authors.

## Abstract

Current all polymer solar cells still suffer from low fill factors (FF) and short-circuit current density ( $J_{sc}$ ) compared with the conventional polymer/fullerene system. Herein in this work, devices using PTP8 as the electron donor and [70]PCBM as well as widely used polymer N2200 as the electron acceptor were systematically studied and compared. The major loss mechanisms in the all polymer solar cells were investigated to understand their relatively lower performance than the PTP8/fullerene system. By performing in-depth analysis on ultrafast transient transmission spectroscopy results, we estimated that in PTP8/N2200 device nearly half of the charges recombine geminately, which is confirmed as the major factor hindering the device performance of all polymer solar cells compared with polymer/fullerene

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