

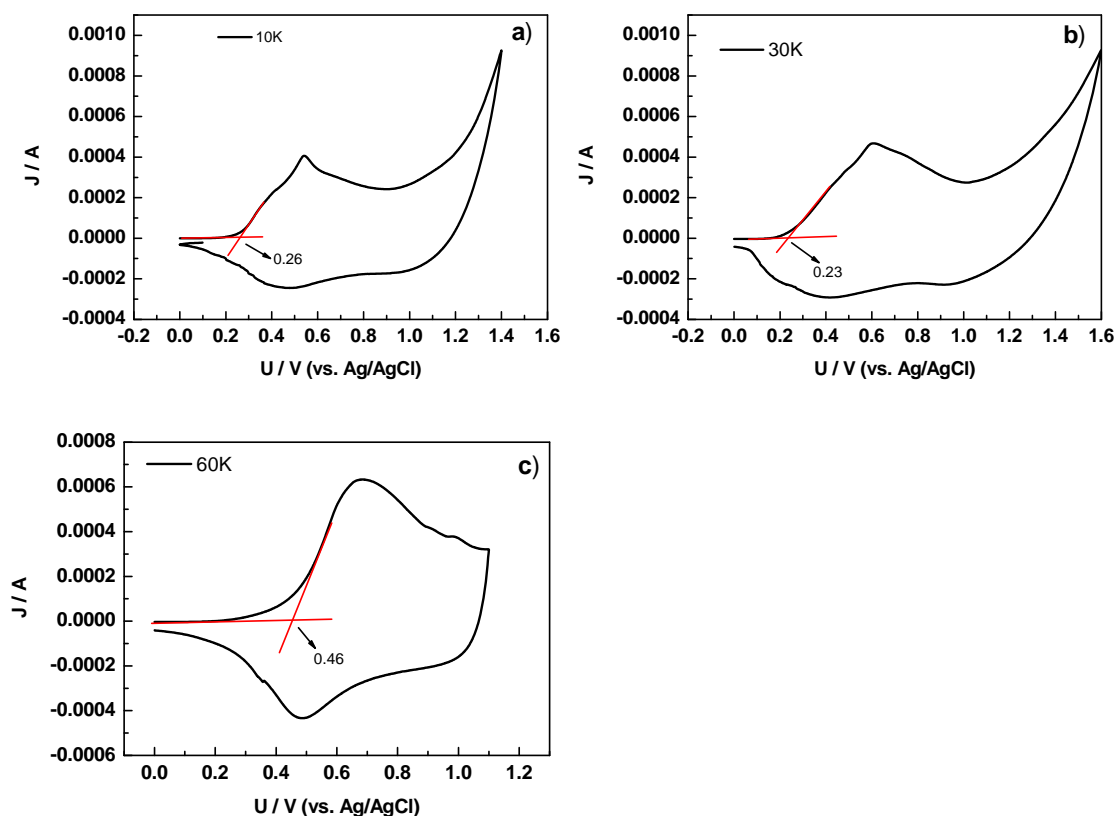
## Supporting Information

for *RSC Advances*

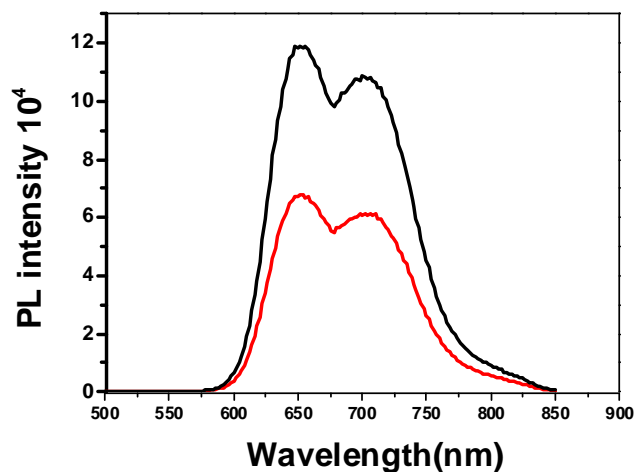
### Effect of the Molecular Weight of Poly(3-hexylthiophene) on the Performance of Solid-State Dye-sensitized Solar Cells

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Cyclic voltammetry (CV) measurements were performed with a CHI 660 electrochemical workstation. The samples used for analysis were the same as those for UV-vis measurements. Tetrabutylammonium hexafluorophosphate (TBAPF<sub>6</sub>, 0.1 M) in acetonitrile was used as the supporting electrolyte. FTO substrate, nonaqueous Ag/AgNO<sub>3</sub> electrode, and glassy carbon electrode were used as the working, reference, and counter electrodes, respectively. The scan rate was 0.1 V s<sup>-1</sup>. Ferrocene/ferrocenium (Fc/Fc<sup>+</sup>) couple was used as the internal reference, and all the potentials were calibrated with Fc/Fc<sup>+</sup>. The highest occupied molecular orbital (HOMO) energy level is calculated based on the following equation:  $E_{\text{HOMO}} = -4.80 - E_{\text{ox}}$  (onset potential vs. Fc/Fc<sup>+</sup>) (eV). The lowest un-occupied molecular orbital (LUMO) energy level is estimated by the equation:  $E_{\text{LUMO}} = E_{\text{HOMO}} - E_{\text{g}}$ .



**Figure S1** Cyclic voltammetry (CV) measurement of P3HT of MW=10kDa a), MW=30kDa b) and MW=60kDa c) on the glassy carbon electrodes. 0.1 M TBAPF<sub>6</sub> in acetonitrile was used as supporting electrolyte. Nonaqueous Ag/AgNO<sub>3</sub> electrode, and platinum wire were used as the reference, and counter electrodes, respectively. The scan rate was 0.1 V s<sup>-1</sup>. Ferrocene/ ferrocinium (Fc/Fc<sup>+</sup>) couple was used as the internal reference. The HOMO energy levels for P3HT with different molecular weights were evaluated to be ~-5.02, -4.99, -5.22 eV (vs. vacuum), respectively.



**Figure S2** Photoluminescence spectra of the TiO<sub>2</sub>/P3HT film (black line) and TiO<sub>2</sub>/Z907Na/P3HT film (red line). Excitation wavelength was 500 nm.