Effect of the End Group of Regioregular Poly(3-hexylthiophene) Polymers on the Performance of Polymer/Fullerene Solar Cells

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Effect of the End Group of Regioregular Poly(3-hexylthiophene) Polymers on the Performance of Polymer/Fullerene Solar Cells

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Outline

- 1. Abstract
- 2. Experiment
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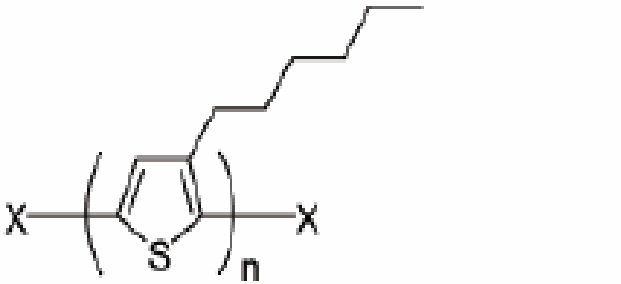
Abstract ：

本篇paper是在研究regioregular P3HT接上不同的end groups (bromine or hydrogen) 後，和PCBM混合做成polymer solar cell ，比較不同的end groups ，對其元件表現的影響。

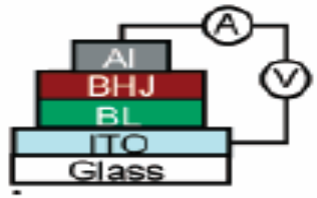
Experiment

:



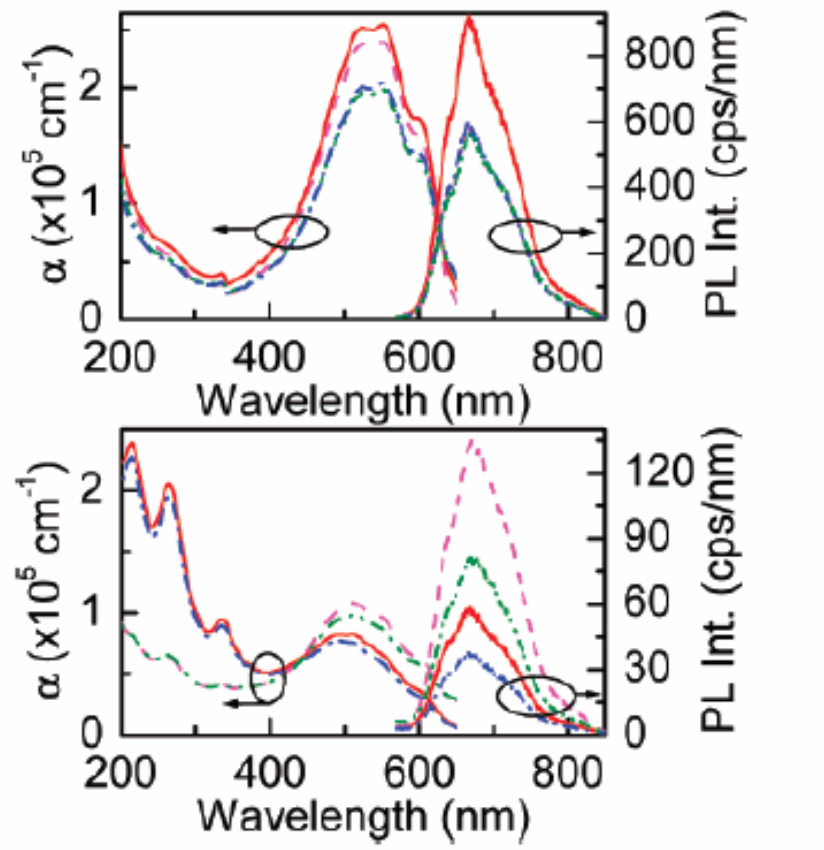
P3HT-H (X=H) and P3HT-Br (X=Br)

圖一： Chemical structure of 95.2% regioregular P3HTs with different end groups (X)

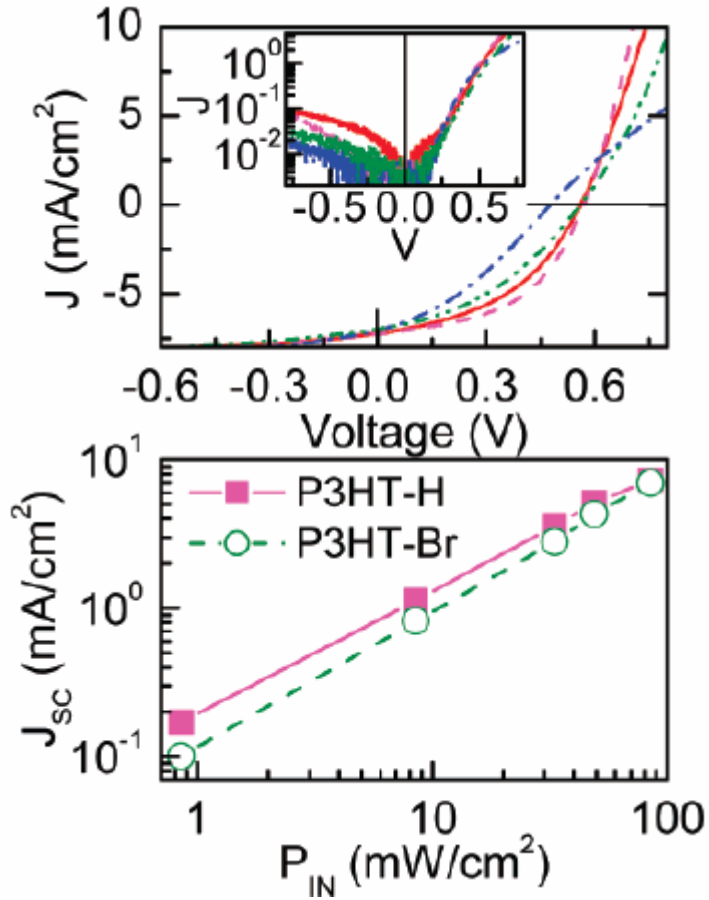


圖二：元件結構

Result

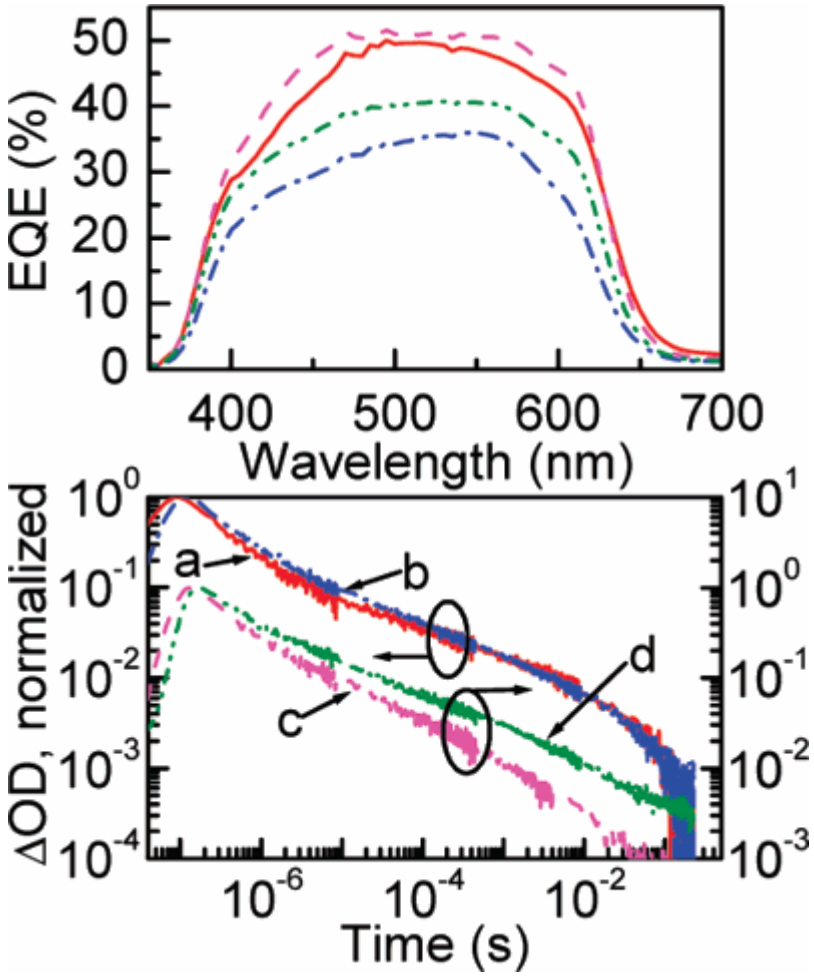


圖三：(上圖) ：單純P3HT的光吸收及PL圖
(下圖) ：P3HT和PCBM製成 polymer solar cell 後的光吸收及PL圖

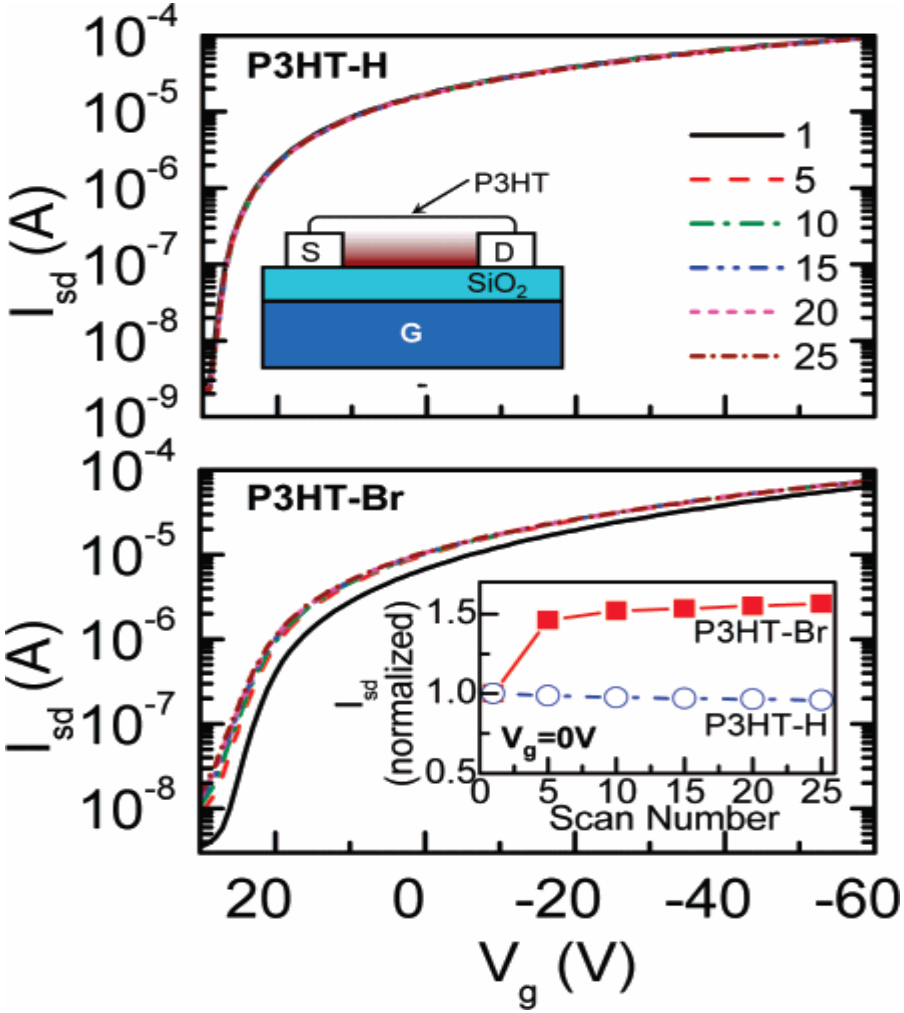


圖四：(上圖) ： Light and dark *J-V characteristics under AM1.5 simulated solar light illumination*
(下圖) ：已annealed 的polymer solar cell 的Jsc對入射光強度作圖

	P3HT-H, unannealed device	P3HT-H, annealed device	P3HT-Br, unannealed device	P3HT-Br, annealed device
J_{SC} (mA/cm2)	7.26	7.28	7.02	6.97
V_{OC} (V)	0.56	0.57	0.48	0.56
FF (%)	43.9	49.7	34.9	39.3
PCE (%)	2.1	2.4	1.4	1.8
RS (Ω)	676	572	1009	926



圖五：(上圖) ： polymer solar cell的 EQE spectra
(下圖) ： transient absorption (△ OD) decay



圖六： Source-drain current (*Isd*) - *gate voltage (Vg) transfer* characteristics of OFETs.

Conclusion ：

1 、 End group 對由regioregular P3HT和PCBM所製成的polymer solar cells 的表現有很大的影響，特別是在低光強度的入射光下。

2 、 由bromine 和 hydrogen 所製成的end groups of regioregular P3HT ，可以由所製成的OFET看出，最大的不同在於由P3HT-Br所製成的元件具有比較強的charge-trapping effect 。