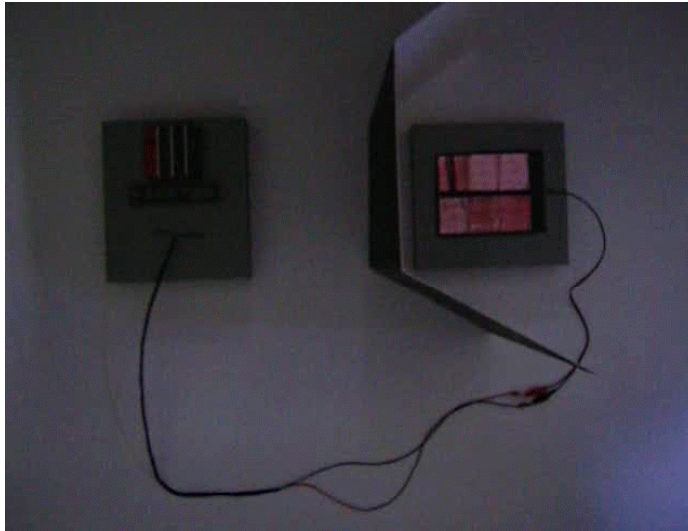


**High Efficiency BHJ Solar Cells with IQE
Approaching 100% fabricated with
the Poly (2,7-Carbazole) Copolymer, PCDTBT**

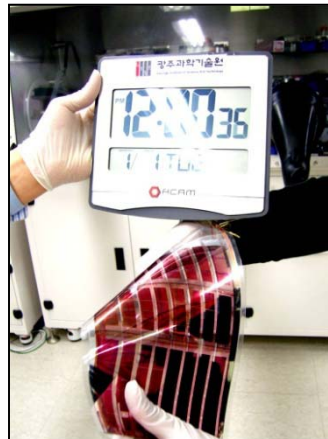
Sung Heum Park

*Heeger Center for Advanced Materials,
Gwangju Institute of Science and Technology, Korea*

Low cost « Plastic » Solar Cell



- i) Large area*
- ii) Easy fabrication*
- iii) Room temp. processibility*
- iv) Thin film form*
- v) Flexibility*
- vi) Mass production (Spin cast, Ink-jet printing method, etc.)*
- vii) Low cost*

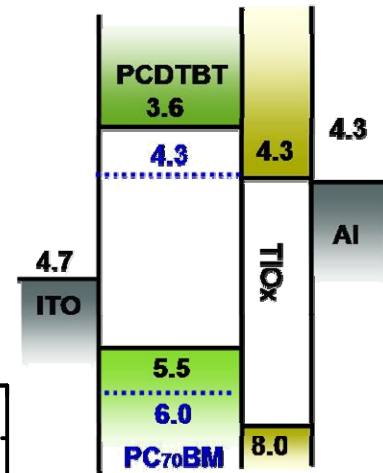
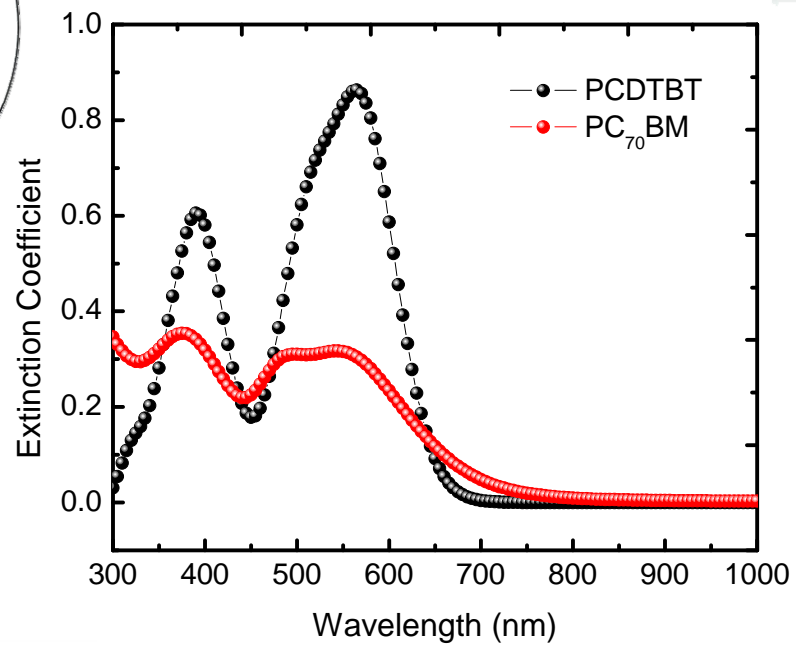
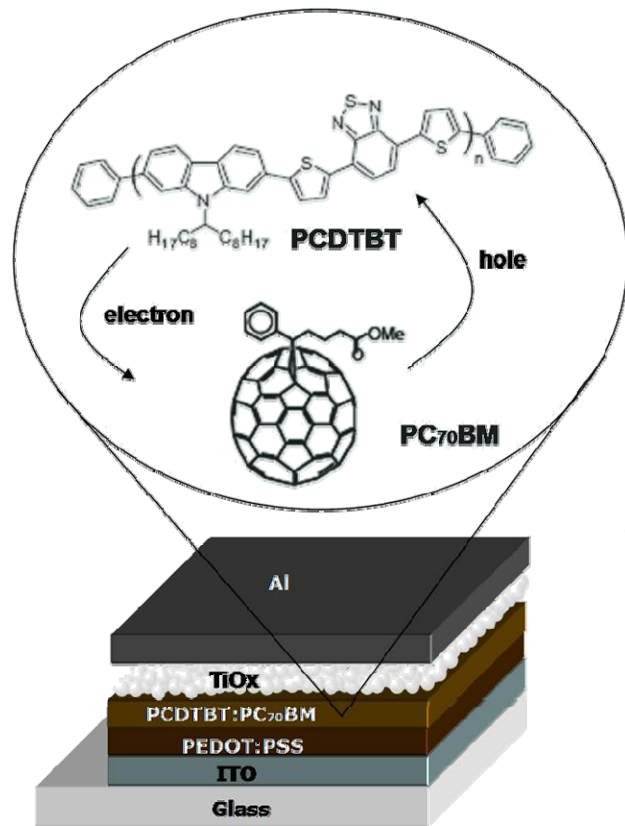


Higher Efficiency ?

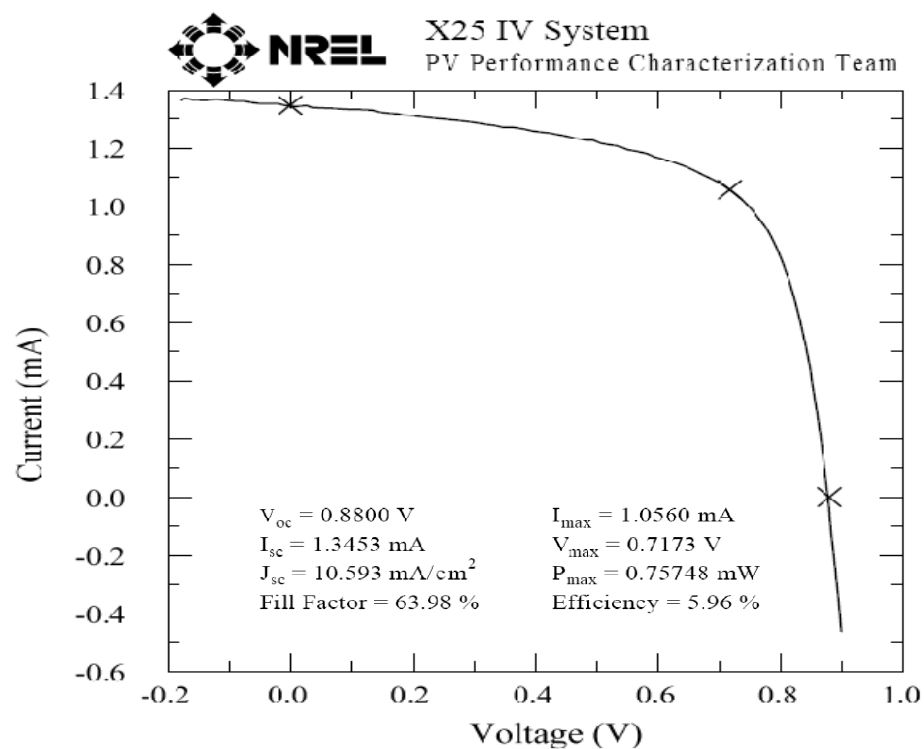
$$\text{Efficiency} = I_{sc} \times V_{oc} \times FF / \text{Power}$$

- I_{sc} :
 - Better harvest of solar spectrum
 - Increase absorption in active layer
 - Improve Internal Quantum Efficiency
- V_{oc} :
 - Higher HOMO
 - Lower LUMO
 - Increase internal Field
- FF :
 - Higher Carrier Mobility
 - Decrease Internal resistance

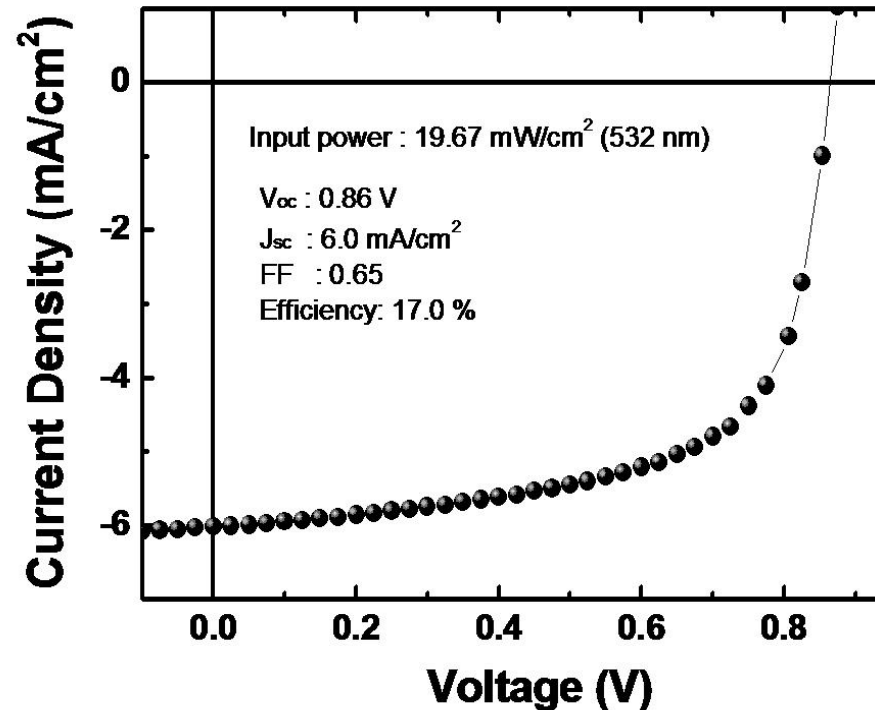
Device Structure



Certificated Efficiency

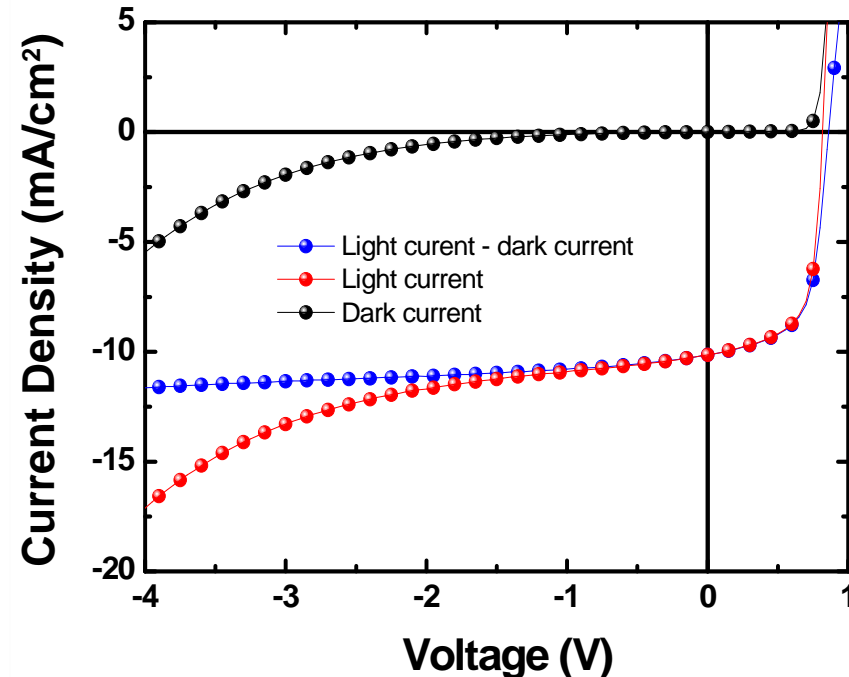
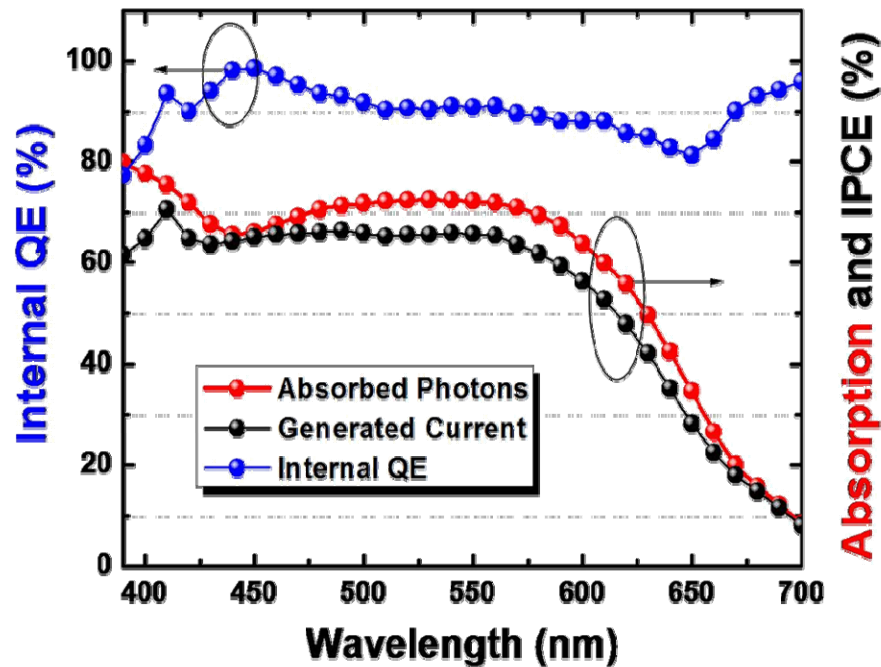


6% under AM 1.5 condition



17% under green light condition

Internal Quantum Efficiency of Device



Every photon absorbed leads to a separated pair of charge carriers!!!
Every photogenerated mobile carrier is collected at the electrode!!!

Summary

- **High efficiency BHJ solar cell has been demonstrated.**

PCE ~ 6% under AM 1.5G

PCE~ 17% with monochromatic radiation (532 nm)

- **IQE of device approaches 100%**

Every photon absorbed leads to a separated pair of charge carriers and that every photogenerated mobile carrier is collected at the electrode

"There is fundamentally no problem that cannot be overcome with regard to collecting charge from polymer solar cells".