

# LAB MODULE 3 OF 4: POLYMER SOLAR CELL : PRE-LAB QUESTIONNAIRE

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## ***Fabrication and Characterization of an Organic Photovoltaic Device***

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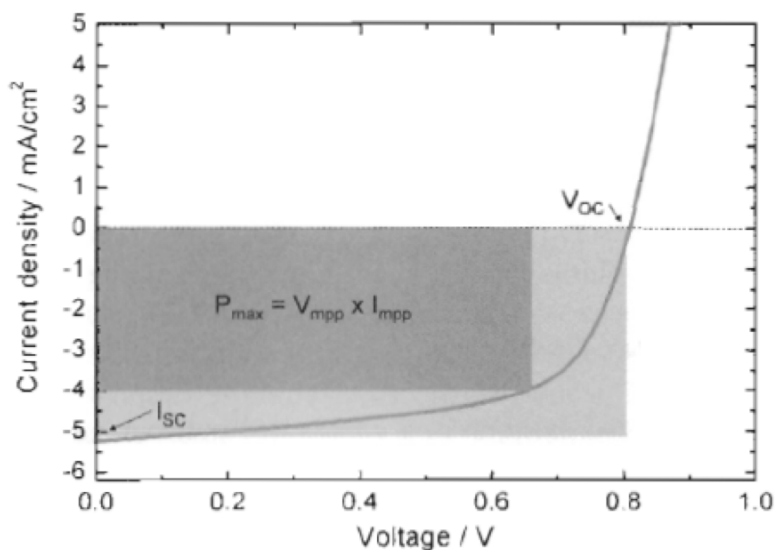
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*On the Efficiency of an Organic Solar Cell*



1. Consider the plot of Current Density vs. Voltage above from data of a generic organic solar cell (from “Conjugated Polymer-Based Organic Solar Cells”, by G. Dennler, N.S. Sariciftci, and C.J. Brabec, in *Semiconducting Polymers: Chemistry, Physics, and Engineering*, 2nd Edition, ed. by G. Hadziioannou and G.G. Malliaras, 2007.).

a. What is the Open Circuit Voltage?

b. What is the Short Circuit Current Density?

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c. Calculate the Power (in  $\text{mW}/\text{cm}^2$ ) at the Maximum Power Point.

d. Calculate the Fill Factor.

e. If a light source of  $100 \text{ mW}/\text{cm}^2$  is incident on this organic solar cell, and the active area is found to be  $1.5 \text{ cm} \times 2.0 \text{ cm}$ , What is the overall efficiency of the solar cell?

**2. Considering the same organic solar cell, we will now calculate the External Quantum Efficiency (EQE) at the maximum power point. Assume the source is monochromatic at  $523 \text{ nm}$ .**

a. What is the number of photons per second per area incident on the active area?

b. What is the number of electrons per second per area generated at the maximum power point?

c. What is the External Quantum Efficiency? Recall that EQE is the ratio of the number of charge carriers produced to the number of photons incident on the active area. Your answer should be in units of percent.