E2-34 Relationship for photocurrent quantum efficiency with a number of Langmuir-Blodgett films on p-CuI

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Dye sensitization with Langmuir-Blodgett (LB) films is becoming popular, since it has the ability to make artificial molecular arrangements on the wide band gap semiconductors. The main disadvantage in the dye sensitized solar cells is the recombination centre of dye clusters formed on the semiconductor surface during the dye deposition. Here, LB method is attractive since it minimizes the dye aggregation on the semiconductor surface. From this investigation remarkable photocurrent enhancement can be observed when M-C_{18} sensitizes the wide band gap p-CuI. When the molecular concentration of the LB films are increased photocurrent quantum efficiency (ϕ) behaves according to the relationship:

$$\phi = AD_o - BD_o^2 + CD_o^3$$

D_o - No. of molecules. on p-CuI (molecules cm^{-2})

A,B,C are constants depending on the reaction rates of photophysical and photochemical processes involved in the sensitization process at electrolyte interface.

This relationship is extremely important in order to understand the factors which can be influenced to enhance the photocurrent quantum efficiency for the future dye sensitized solar cells. It is interesting to mention, when M-C_{18} molecules are deposited by simple dipping technique, the above relationship reduces as follows:

$$\phi = AD_o - BD_o^2$$

The magnitude of the constant A depends on the rate constants of photocurrent generation and B depends ont he energy dissipative processes with the sensitization mechanism A,B,C constants can be calculated from the rate constants of photophysical and photochemical processes associated with sensitization mechanism.

Financial assistance from NARESA (RG/96/P/05) Ruhuna University Research fund, UGC Hiran Thilakarathna Research fund and Kanazawa University Japan are acknowledged.