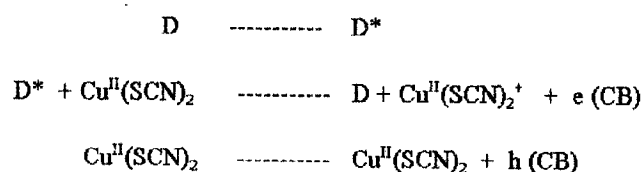


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Among the semiconductor materials related to dye sensitized solar cells, p-CuSCN reached to a remarkable level. p-CuSCN can be sensitized using disordered and ordered molecular arrangements and proved that the sensitization process involved was cathodic sensitization. Here, we report a sensitization process in which a sharp photocurrent enhancement can be observed ( $\lambda = 480\text{nm}$ ) in the sensitization process with compared to that of bare p-CuI sensitizing a surface state. The formation of surface states in p-CuSCN was found previously due to  $\text{Cu}^{\text{II}}(\text{SCN})_2$ , and confirmed using cyclic voltametry.

According to the photoluminescence measurements, peak appears at  $\lambda = 480\text{ nm}$ , corresponding to the emission from conduction band to the upper level of surface state. The emission from conduction band to valence band corresponds at  $\lambda = 390\text{ nm}$ . Crystal violet dye has the ability to sensitize the semiconductor using valence band and the surface states. In the photocurrent action spectra 2 peaks can be observed at  $\lambda = 480\text{ nm}$  (sharp peak) and  $\lambda = 540\text{ nm}$ . We propose the following mechanism for the sensitization of surface states.



Excited dye molecules transfer energy to  $\text{Cu}^{\text{II}}(\text{SCN})_2$ . After transferring electrons to conduction band from the surface state, unstable  $\text{Cu}^{\text{II}}(\text{SCN})_2^+$  may return to relatively stable  $\text{Cu}^{\text{II}}(\text{SCN})_2$  at room temperature by releasing a hole to valence band. Reached photocurrent quantum efficiency at  $\lambda = 480\text{ nm}$  is  $\sim 25\%$ .

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