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Surface trap mediated recombinations in dye-sensitized solid-state solar cell with CuI as hole collector

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Surface states at dye and semiconductor interface induce recombinations in dye-sensitized solid-state solar cells that greatly reduce the efficiency. CuI is a one of the p-type semiconductor that has been identified suitable for fabricating dye-sensitized solid-state solar cells giving reasonably high photocurrents and voltages. In this work we have observed that the iodine adsorbed at the surface of CuI film act as hole traps affecting the performance of the cell. Fluorescencespectroscopic measurements revealed that presence of iodine at the surface of the CuI films create surface trap 0.2 eV above the valence band edge. Exposure of CuI films to radiations with energies higher than the band gap excitation energy released iodine in the bulk and capping the CuI crystallites with thin layer of triethylamine thiocyanate seems to prevent the coming of this liberated iodine to the surface.