Letter

Doping CuSCN films for enhancement of conductivity: Application in dye-sensitized solid-state solar cells

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Abstract

Construction of dye-sensitized solid-state solar cells requires high band-gap (therefore, transparent) hole collectors which can be deposited on a dye-coated nanocrystalline semiconductor surface without denaturing the dye. Copper (I) thiocyanate (CuSCN) is an important p-type semiconductor satisfying the above requirements. However, the conductivity of this material, which depends on excess SCN, is not sufficiently high and polymerization of SCN prevents incorporation of sufficient amount of excess SCN during the process of synthesis of CuSCN. We have found that the conductivity of solid CuSCN can be increased by exposure to halogen gases which generate SCN or to a solution of $(SCN)_2$ in CCl_4. The latter method is suitable for doping of CuSCN films in dye-sensitized solid-state solar cells.

Keywords: CuSCN; TiO_2; Hole collectors; Dye-sensitized solar cells; Doping semiconductors