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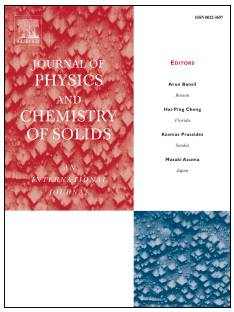

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Reduction of Chromium (VI) on the Hetero-system $CuBi_2O_4/TiO_2$ under Solar Light

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Abstract

The $CuBi_2O_4/TiO_2$ heterojunction was tested with success for the photo-catalytic reduction of chromate ions under sunlight. $CuBi_2O_4$, prepared by nitrate process, was characterized photo-electrochemically. The oxide is stable against photo corrosion by consumption of holes in presence of oxalic acid. The light absorption promotes electrons in the conduction band of the sensitizer ($CuBi_2O_4$) with a very negative potential (-1.74 V_{SCE}) to participate in the exchange of the electron with $HCrO_4^-$. The enhanced activity is due to electron injection of activated $CuBi_2O_4$ into TiO_2-CB (-0.97 V_{SCE}). The band gap of the semiconductor $CuBi_2O_4$ is 1.50 eV with a direct optical transition. This compound is a *p*-type semiconductor with a flat band potential of -0.39 V_{SCE} and activation energy of 0.18 eV. The electrochemical impedance spectroscopy was undertaken to study the semiconductor/electrolyte interfacial phenomena. The photactivity on the heterojunction is strongly enhanced. A remarkable performance is obtained in less than 4 h for a concentration of 30 mg in (Cr (VI)) at pH ~ 4 and a dose of 1 mg/ml; a 98% reduction has been obtained. The kinetic of chromate photoreduction is well described by the Langmuir-Hinshelwood model. The chromate elimination obeys to a pseudo-first order kinetic with an apparent rate constant of 0.014 min^{-1}.

***Keywords*:** Hetero-system $CuBi_2O_4/TiO_2$; Chromate reduction; solar light; Semiconductor photocatalysis; Langmuir-Hinshelwood.

Introduction

The growth of population and agro-industrial activities are increasing pressure on water reserves. The water treatment seems to be an inevitable solution for the environmental