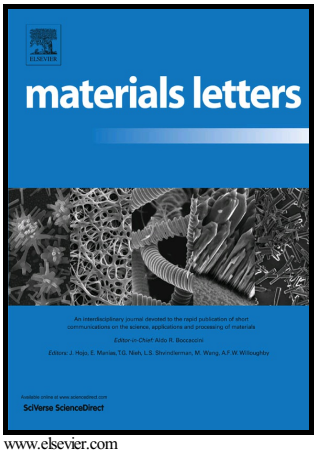

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Synthesis of Sn-containing Anatase (TiO_2) by Sol-Gel method and their performance in catalytic water splitting under visible light as a function of tin content

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Abstract

Sol-gel route was employed to prepare a series of Sn-containing anatase with different molar (Ti/Sn) ratios ranging from 49 to 1. Samples were characterized by powder XRD, UV-Vis, XPS, SEM, EDAX, low temperature N_2 sorption technique and Raman Spectroscopy. Except anatase phase, no other crystalline phase was observed when Ti/Sn molar ratio was varied from 49 to 9 and for Sn free sample. However, further decrease in the ratio lead to the appearance of additional SnO_2 phase whose peak intensities were increased with the increase in the tin content. Irrespective of tin content, all samples showed red-shift in UV-Vis spectra. Moreover, samples showed Raman shift to higher vibration side from 143 cm^{-1} to 147 cm^{-1} indicating the doping of Sn^{2+} into TiO_2. By virtue of low band gap, anatase crystallite size and an absence of XRD visible SnO_2, ST (19) has shown maximum photocatalytic activity upon 1wt% Pt loading. It has exhibited the highest rate (0.1264 mmole/g/h) for visible light induced hydrogen evolution by water splitting.

Key Words: Semiconductors, Sol-gel preparation, Sn^{2+} doped Titania, Water splitting, Visible light, SnO_2/TiO_2

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1. Introduction

Titania (TiO_2) has shown potential as semiconductor photocatalysts due to physico-chemical stability, resistance to photocorrosion and economic [1]. However, its application for visible light driven photocatalysis is limited owing to relatively high electron-holes recombination rate, ease of agglomeration and the activation energy requirement in a range of