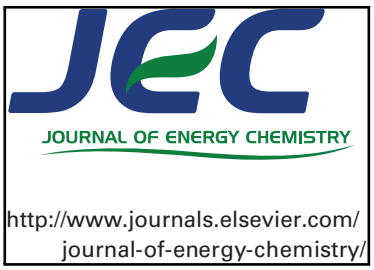

Insights into electrolyte effects on photoactivities of dye-sensitized photoelectrochemical cells for water splitting

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Insights into electrolyte effects on photoactivities of dye-sensitized photoelectrochemical cells for water splitting

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Abstract

Dye-sensitized photoelectrochemical cell (DS-PEC) is an especially attractive method to generate hydrogen via visible light driven water splitting. Electrolyte, an essential component of DS-PEC, plays a great role in determining the photoactivities of devices for water splitting. When using phosphate buffer (pH = 6.4) as electrolyte, the DS-PEC displayed much higher photoactivity than using 0.1 M Na_2SO_4 (pH = 6.4) as electrolyte. The insight is phosphate anion gathers together to form a negative electrostatic field on TiO_2 surface, which increases the resistance in the TiO_2/catalyst and electrolyte interface and validly reduces the charge recombination from TiO_2 to the oxidized catalyst.

Key words: Water splitting; Molecular device; Photoanode; Electrolyte; DS-PEC

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1. Introduction

Production of hydrogen through light induced water splitting is regarded as an ideal approach to meet the environmental problems and sustainable energy systems. Dye-sensitized photoelectrochemical cells (DS-PECs) emerge as an especially attractive method to generate hydrogen via visible light driven water splitting. Over the past few years, several DS-PECs have been designed and assembled towards this goal [1–9]. In general, an efficient DS-PEC is composed of three parts: a photoanode for water oxidation, a