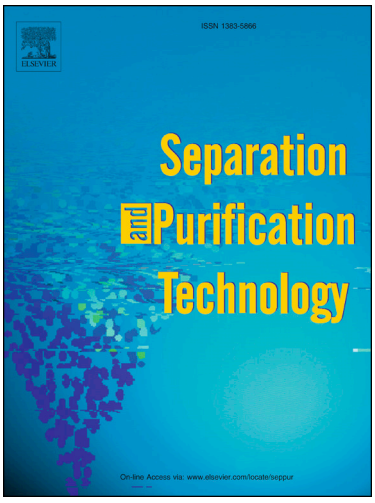

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Synthesis of direct Z-scheme g-C_3N_4/$Ag_2VO_2PO_4$ photocatalysts with enhanced visible light photocatalytic activity

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Abstract

Direct Z-scheme g-C_3N_4/$Ag_2VO_2PO_4$ photocatalysts with enhanced visible light photoactivity were successfully synthesized. Their crystalline structure, morphology, optical, and electrochemical properties were analyzed by X-ray diffractometry, scanning electron microscopy, X-ray photoelectron spectroscopy, UV-vis diffuse reflectance spectroscopy, and electrochemical measurements. The photocatalytic degradation activities of as-prepared samples were evaluated by the photocatalytic of methyl orange (MO) and phenol in the aqueous phase. Compared with pure g-C_3N_4 and $Ag_2VO_2PO_4$, the composites exhibited the higher photocatalytic activity under visible light irradiation. The photoactivity of g-C_3N_4/$Ag_2VO_2PO_4$-0.4 is nearly 4 and 3 times higher than $Ag_2VO_2PO_4$ and g-C_3N_4 for removal MO, respectively. Based on experimental results, the mechanistic regarding the direct Z-scheme electron transfer from $Ag_2VO_2PO_4$ to g-C_3N_4 was proposed. The electron injection from conduction band of $Ag_2VO_2PO_4$ to valence band of g-C_3N_4 suppresses the fast recombination rate and prolongs the charge carrier lifetime, thereby resulting in improved photoactivity. Furthermore, the photostability and active species during the photocatalysis was investigated.

Keywords: $Ag_2VO_2PO_4$; C_3N_4; direct Z-scheme; heterojunction; photocatalyst

1.Introduction

Over the past few decades, the quick development of industry has led to the global energy shortage and environmental crises. Compared with adsorption [1,2], semiconductor based photocatalysis technique under sunlight irradiation has attracted increasing attention due to its wide potential applications in addressing environmental and energy issues [3]. Further taking into account the solar energy distribution in ultraviolet, visible, and infrared light with a proportion of about 7%:50%:43% [4], the applicable photocatalysts should

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