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Phosphorus-doped cerium vanadate nanorods with enhanced photocatalytic activity

Zhendong Liu¹, Ke Sun², Mingzhi Wei², Zhen Ma^{1,3,*}

¹ Shanghai Key Laboratory of Atmospheric Particle Pollution and Prevention (LAP³), Department of Environmental Science and Engineering, Fudan University, Shanghai, 200433, P. R. China

² Shandong Provincial Key Laboratory of Processing and Testing Technology of Glass & Functional Ceramics, School of Material Science and Engineering, Qilu University of Technology (Shandong Academy of Sciences), Jinan 250353, P.R. China

³ Shanghai Institute of Pollution Control and Ecological Security, Shanghai 200092, P.R. China

Abstract

CeVO₄-based photocatalysts have been actively studied, but P-doped CeVO₄ with enhanced photocatalytic activity has not been reported. Herein, novel P-doped CeVO₄ nanorods were synthesized *via* a facile hydrothermal method. The doped P exists as PO₄ tetrahedron which replaces VO₄ tetrahedron. The crystal size, specific surface area, and light absorption ability of CeVO₄ were tuned after being doped by P. In particular, the separation and transmission efficiency of photogenerated electron-hole pairs were improved due to the internal electric field formed by the large charge density around PO₄ tetrahedron. This conclusion was also confirmed by DFT calculations. The photocatalytic activities of different samples were tested via photodegradation of aqueous organic pollutants, and a feasible mechanism of photocatalytic reaction was proposed.

* Corresponding author. E-mail address: zhenma@fudan.edu.cn. (Z. Ma).

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