

Pt/BiOCl 纳米片的制备、表征及其光催化性能

余长林^{1,*}, 陈建钗^{1,2}, 操芳芳¹, 李鑫¹, 樊启哲¹, YU Jimmy C3, 魏龙福¹

1江西理工大学冶金与化学工程学院, 江西赣州 341000; 2福建省光催化重点实验室-省部共建国家重点实验室培育基地 (福州大学), 福建福州 350002; 3香港中文大学化学系, 香港

YU Changlin^{1,*}, CHEN Jianchai^{1,2}, CAO Fangfang¹, LI Xin¹, FAN Qizhe¹, YU Jimmy C3, WEI Longfu¹

1School of Metallurgy and Chemical Engineering, Jiangxi University of Science and Technology, Ganzhou 341000, Jiangxi, China; 2Fujian Provincial Key Laboratory of Photocatalysis-State Key Laboratory Breeding Base, Fuzhou University, Fuzhou 350002, Fujian, China; 3Department of Chemistry, The Chinese University of Hong Kong, Hong Kong, China

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摘要 采用光化学沉积法制备了一系列不同 Pt 含量的新型 Pt/BiOCl 纳米片光催化剂, 运用 N₂ 物理吸附-脱附、X 射线粉末衍射、扫描电镜、透射电镜、X 射线光电子能谱、光致发光光谱、紫外-可见漫反射光谱等手段对 Pt/BiOCl 进行了表征, 并以 λ = 254 nm 的紫外灯和钨灯为光源, 考察了 Pt 含量对 Pt/BiOCl 光催化降解酸性橙 II 活性的影响。结果表明, 沉积的 Pt 对 BiOCl 样品比表面积的影响不大, 但可有效增强催化剂对可见光的吸收能力, 显著抑制光生电子与空穴的复合。当 Pt 含量为 1%~2% 时, 能大幅度提高紫外光下 BiOCl 催化降解染料的活性, 并产生可见光活性。这是由于 Pt/BiOCl 具有一定的可见光吸收能力, 产生了 Pt 纳米粒子的等离子体光催化作用。

关键词: 铂纳米粒子 铋氧氯 光催化 可见光 酸性橙 II

Abstract: A series of novel Pt/BiOCl nanoplate photocatalysts were synthesized by a photodeposition method. The as-synthesized products were characterized by N₂ physical adsorption, X-ray diffraction, scanning electron microscopy, transmission electron microscopy, X-ray photoelectron spectroscopy, photoluminescence (PL) emission spectroscopy, and UV-Vis diffuse reflectance spectroscopy (DRS). The photocatalytic activity of the samples was evaluated by photocatalytic degradation of acid orange II under both UV light (λ = 254 nm) and visible light irradiation. The N₂ physical adsorption test showed that the deposition of Pt nanoparticles could not produce obvious change in the specific surface area of the catalyst. The UV-Vis DRS results indicated that the presence of Pt nanoparticles could effectively increase the visible light absorption ability of Pt/BiOCl. The PL spectra indicated that Pt could effectively suppress the recombination of photogenerated hole-electron pairs of Pt/BiOCl. Activity tests showed that the deposition of Pt (1% - 2%, mass fraction) greatly promotes the UV right photocatalytic activity. Pt also brought about an obvious visible light activity, which could be attributed to the visible light absorption and plasmon photocatalysis role of deposited Pt nanoparticles.

Keywords: platinum nanoparticle, bismuth oxychloride, photocatalysis, visible light, acid orange II

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