磁性光催化降解复合材料的设计和制备

Design and preparation of magnetic photocatalytic degradation composite material

摘要

光催化是一种催化降解污染物的有效方法，磁性半导体纳米材料的能带结构较为特殊，在自然条件下光照便能激发其内部电子的跃迁，借助一系列化学反应，达到降解有机污染物的目的，绿色环保，催化材料可回收利用，从而提高了资源再利用效率。但目前大多纳米光催化材料具有禁带宽度较宽、量子效率低、太阳能利用效率偏低及不易回收等缺点，这些缺点大大制约了光催化技术的工业化发展。近几十年来，国内外学者为了提升光催化材料的催化活性开展了广泛的研究，利用各种手段来调整带隙，增强光吸收，抑制光生载流子复合。磁性纳米粒子既有纳米材料的优良光催化特性，又具有磁性，可在外加磁场的作用下轻松回收，大大降低了使用成本。本研究综述近几年来国内外关于磁性光催化材料设计和制备的方法，并对未来光催化复合材料领域的发展进行了展望。

关键词：光催化 磁性复合材料 纳米材料 半导体掺杂 半导体复合

Abstract

Photocatalysis is an effective method for catalytic degradation of pollutants. The band structure of magnetic semiconductor nanomaterials is relatively special. Under natural conditions, light can stimulate the transition of internal electrons. With a series of chemical reactions, the purpose of degradation of organic pollutants can be achieved. The green environment is guaranteed, and the catalytic materials can be recycled, thus improving the efficiency of resource reuse.However, most of nano photocatalytic materials have some disadvantages, such as wide band gap, low quantum efficiency, low solar energy utilization efficiency and difficult to recover, which greatly restrict the industrialization development of photocatalytic technology. In recent decades, in order to improve the photocatalytic activity of photocatalytic materials, scholars at home and abroad have carried out extensive research, using various means to adjust the band gap, enhance the light absorption, and inhibit the photogenerated carrier recombination. Magnetic nanoparticles not only have excellent photocatalytic properties of nano materials, but also have magnetic properties, which can be easily recovered under the effect of external magnetic field, greatly reducing the cost of use. In this paper, the design and preparation methods of magnetic photocatalysis materials at home and abroad in recent years are reviewed, and the future development of photocatalysis composite materials is prospected.

Key words: photocatalysis magnetic composite material nanometer material Semiconductor doping semiconductors coupling