

一、**项目名称:** 光电催化纳米材料的制备及其污染物检测与降解应用研究

二、**推荐单位:** 哈尔滨工业大学

三、**推荐等级:** 中国分析测试协会分析测试科学奖 二等奖

四、项目简介

本项目针对能源短缺、污染物的检测与降解等问题，聚焦于开发高效、清洁的光电催化能源转换材料及污染物检测和降解材料，主要研究内容包括光电催化纳米材料的制备及其对 CO_2 和 N_2 的高效还原性能研究，改性电极的制备及其污染物检测性能的研究，以及光催化微纳米材料的制备及其污染物降解和抗菌性能研究。本项目创造性地构建了 Z 型异质结催化剂、Fe 掺杂催化剂和碳包覆金属氧化物催化剂，实现了 CO_2 和 N_2 的高效还原；开发了改性的丝网印刷及玻碳电极，实现了对 Cd^{2+} 、 Pb^{2+} 等重金属离子的高选择性、低检出限检测；制备了多种光催化微纳米材料，具有高效的光催化降解有机物及抗菌性能，实现水体除菌的同时降解有机物。本项目将在助力碳中和，促进清洁能源转换，同时为水体污染物的检测和污染物降解处理提供高效、低成本的解决方案。项目成果在国际上产生广泛影响，受到国际学术界的高度认可，相关研究结果已发表于 *Chemical Engineering Journal*、*Journal of Materials Chemistry A*、*Materials Today Energy* 等国际权威期刊，总计 39 篇。授权国家发明专利 3 项。研究成果被 *Chem. Soc. Rev.*、*JACS*、*Angew. Chem. Int. Ed.*、*Adv. Mater.* 等高水平杂志大篇幅引用和正面评价，总引用 992 次。

五、代表性成果目录

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