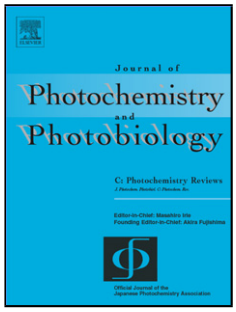

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Author: Xiangchao Meng Zisheng Zhang Xingang Li

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Synergetic Photoelectrocatalytic Reactors for Environmental Remediation: a Review

Xiangchao Meng[2], Zisheng Zhang[1,2]*, Xingang Li[1]*

1: School of Chemical Engineering and Technology, Tianjin University, Tianjin, China

2: Department of Chemical and Biological Engineering, University of Ottawa, Ottawa, Canada K1N 6N5

*Corresponding authors: Zisheng Zhang: 16135625800 (6110); Xingang Li: +2227404701

E-mail addresses: xmeng086@uottawa.ca (X. Meng), zzhang@uottawa.ca (Z. Zhang); lxg@tju.edu.cn (X. Li)

Abstract

Integrating electrochemistry with photocatalytic technology, photoelectrocatalysis has been identified as a superior candidate to debottleneck photocatalytic processes. Photoelectrocatalysis involves a photocatalytic system to which an external positive bias is applied, which can significantly increase the rates of photocatalytic reactions by driving the photo-generated electron-hole pairs in opposite directions, reducing their recombination rates. The design of a cost-efficient photoelectrocatalytic reactor plays a critical role in the ultimate acceptance of this promising technology in industry for environmental remediation as well as other applications. In this study, photoelectrocatalysis and associated novel reactor designs reported in recent years are reviewed and discussed. Some of the topics which are discussed in this study include various reactor configurations with different illumination sources, photocatalyst utilization modes, and electrodes as well as composite systems incorporating solar cells in addition to microbial and photocatalytic fuel cells. Future efforts are suggested to push the industrial application of photoelectrocatalysis out of its infancy.

Keywords: Photoelectrocatalysis; Photoelectrocatalytic reactor; Catalytic electrode; Immobilized film; Environmental remediation