

## Accepted Manuscript

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PII: S0167-577X(17)31908-0  
DOI: <https://doi.org/10.1016/j.matlet.2017.12.141>  
Reference: MLBLUE 23639

To appear in: *Materials Letters*

Received Date: 3 December 2017  
Revised Date: 21 December 2017  
Accepted Date: 28 December 2017

Please cite this article as: Y-H. Chin, J-C. Sin, S-M. Lam, A facile route for fabrication of hierarchical porous Nb<sub>2</sub>O<sub>5</sub>/ZnO composites with enhanced photocatalytic degradation of palm oil mill effluent, *Materials Letters* (2017), doi: <https://doi.org/10.1016/j.matlet.2017.12.141>

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**A facile route for fabrication of hierarchical porous Nb<sub>2</sub>O<sub>5</sub>/ZnO composites with enhanced photocatalytic degradation of palm oil mill effluent**

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## ABSTRACT

A facile route was demonstrated for the synthesis of hierarchical porous ZnO microspheres based on a surfactant-free chemical solution method. The as-synthesized ZnO were assembled by large numbers of interleaving nanosheets and formed an open porous structure. Under UV irradiation, the as-synthesized ZnO exhibited photocatalytic property on the degradation of palm oil mill effluent (POME) solution. The Nb<sub>2</sub>O<sub>5</sub> decorated ZnO photocatalysts (Nb<sub>2</sub>O<sub>5</sub>/ZnO) with enhanced photocatalytic performances were also synthesized via a facile and rapid route. Compared with ZnO, the Nb<sub>2</sub>O<sub>5</sub>(3 wt%)/ZnO exhibited the best POME degradation and colour removal efficiencies of 91.7% and 100%, respectively after 240 min irradiation. Phytotoxicity of the POME after Nb<sub>2</sub>O<sub>5</sub>/ZnO photocatalysis was significantly reduced via the measurement of radicle lengths of *Vigna radiata*. The observed results demonstrated the photocatalytic technology using hierarchical Nb<sub>2</sub>O<sub>5</sub>/ZnO composites had the potential to effectively purify wastewater.

*Keywords:* Semiconductors, Composite materials, Microstructure, Optical materials and properties

## 1. Introduction

Oily wastewater from palm oil food industry is a thick brownish liquid waste containing extremely high quantities of organic pollutants. Past research report indicated a discharge of 2.5-3.75 tonnes of palm oil

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