

Evaluation of the Photocatalytic Degradation of Pre-Treated Palm Oil Mill Effluent (Pome) Over Pt-Loaded Titania

Chin Kui Cheng^{ab}, Mohd Rizaiddin Derahman^b, Maksudur R. Khan^b

^aRare Earth Research Centre, Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia

^bCentre of Excellence for Advanced Research in Fluid Flow, Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia

ABSTRACT

This paper reports the photocatalytic degradation of pre-treated palm oil mill effluent (POME) over a Pt-doped titania photocatalyst. Pt loading on the titania was varied from 0.25 to 1.0 wt% via alcohol reduction of chloroplatinic acid (H_2PtCl_6). XRD characterization of the photocatalysts showed that the photo-active anatase phase was still intact after the photocatalyst synthesis while the XPS spectrum confirmed that the deposited Pt was free from the Cl and existed as Pt⁰ and Pt⁴⁺. In addition, the UV–vis diffuse reflectance measurement indicated an improved light energy absorption in the visible light spectrum. Moreover, the band gap energy (3.16–3.17 eV) was reduced when titania was doped with Pt, compared to the pristine titania with 3.20 eV. The 0.5 wt% Pt/TiO₂ photocatalyst offered the most effective degradation of pre-treated POME under the irradiation of 100 W of UV light (10%) and also visible light (11%), respectively, over a loading of 0.2 g/L. Significantly, the maximum 0.5 wt% Pt/TiO₂ photocatalyst loading determined from the current work was 1.0 g/L.

KEYWORDS: Photocatalysis; Platinum; Palm oil mill effluent (POME); Titania; Wastewater

DOI: [10.1016/j.jece.2014.10.016](https://doi.org/10.1016/j.jece.2014.10.016)