

## Enhanced Hydrogen Production From Palm Oil Mill Effluent Using Two Stage Sequential Dark And Photo Fermentation

Puranjan Mishra, Sveta Thakur, Lakhveer Singh, Zularisam Ab Wahid, Mimi Sakinah  
Faculty of Engineering Technology, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300,  
Gambang, Kuantan, Pahang, Malaysia

### ABSTRACT

The aim of this study was to investigate the maximum hydrogen yield as well as the chemical oxygen demand (COD) reduction from palm oil mill effluent (POME) by using two stage sequential dark and photo fermentation. The first stage operation was carried out using *Clostridium butyricum* LS2, which has the maximum hydrogen yield of 0.784 ml H<sub>2</sub>/ml POME and COD removal of 57%. The dark fermentative effluent was diluted with 50% of tap water (DEPOME-50), for better penetration of light and was subsequently used as substrate to the second stage fermentation using *Rhodopseudomonas palustris* hydrogen producer. Hydrogen production was monitored under optimized light illumination of 7 klux, in batch mode. The two-stage fermentation enhanced the total hydrogen yield from 0.784 (dark fermentation) to 3.064 ml H<sub>2</sub>/ml POME (dark/photo-fermentation). Meanwhile, a 93% of total COD removal was also achieved.

**KEYWORDS:** Hydrogen; *Clostridium butyricum* LS2; Dark fermentation; Palm oil mill effluent; Photo-fermentation; *Rhodopseudomonas palustris*

**DOI:** [10.1016/j.ijhydene.2016.07.138](https://doi.org/10.1016/j.ijhydene.2016.07.138)