

## Documents

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**Biodegradation of Petroleum Sludge by Methylobacterium sp. Strain ZASH**  
(2023) *Tropical Life Sciences Research*, 34 (2), pp. 197-222.

DOI: 10.21315/tlsr2023.34.2.10

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#### Abstract

A bacterium was isolated from sludge-contaminated soil in a petroleum refinery and tested for its ability to degrade aliphatic hydrocarbon compounds present in petroleum sludge. The isolate was grown on minimal salt media agar supplemented with 1% (w/v) petroleum sludge. The isolate was tentatively identified as *Methylobacterium* s p. s t rain ZASH based on the partial 16s rDNA molecular phylogeny. The bacterium grew optimally between the temperatures of 30°C and 35°C, pH 7 and 7.5, 0.5% and 1.5% (v/v) Tween 80 as the surfactant, and between 1% and 2% (w/v) peptone as the nitrogen source. The constants derived from the Haldane equation were  $\mu_{max} = 0.039 \text{ hr}^{-1}$ ,  $K_s = 0.385\%$  (w/v) total petroleum hydrocarbons (TPH) or 3,850 mg/L TPH, and  $K_i = 1.12\%$  (w/v) TPH or 11,200 mg/L. The maximum biodegradation rate exhibited by this strain was 19 mg/L/hr at an initial TPH concentration of 10,000 mg/L. Gas chromatography analysis revealed that after 15 days the strain was able to degrade all aliphatic n-alkanes investigated with different efficiencies. Shorter n-alkanes were generally degraded more rapidly than longer n-alkanes with 90% removal for C-12 compared to only 30% removal for C-36. The addition of sawdust did not improve bacterial degradation of petroleum hydrocarbons, but it assisted in the removal of remaining undegraded hydrocarbons through adsorption. © Penerbit Universiti Sains Malaysia, 2023.

#### Author Keywords

Biodegradation Kinetics; *Methylobacterium* sp; Petroleum Sludge; Sawdust

#### Index Keywords

adsorption, bacterium, biodegradation, concentration (composition), contaminated land, petroleum hydrocarbon, phylogeny, reaction kinetics, sludge, surfactant

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**Publisher:** Penerbit Universiti Sains Malaysia

**ISSN:** 19853718

**Language of Original Document:** English

**Abbreviated Source Title:** Trop. Life Sci. Res.

2-s2.0-85168902322

**Document Type:** Article

**Publication Stage:** Final

**Source:** Scopus

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