

Effective phenanthrene and pyrene biodegradation using *Enterobacter* sp. MM087 (KT933254) isolated from used engine oil contaminated soil

ABSTRACT

Phenanthrene and pyrene are low and high molecular weights polycyclic aromatic hydrocarbons (pahs) being classified as priority organic pollutants in the environment. this study was aimed to optimizing pahs biodegradation conditions and then identifying intermediate metabolites using effective *enterobacter* sp. mm087 (kt933254). biodegradation quantitative experiments were carried out using colorimetric assay and the intermediate metabolites were identified based on gas chromatography mass spectrophotometer (gc–ms). *enterobacter* sp. mm087 initially degraded 80.2% phenanthrene (500 mg/l) and 59.7% pyrene (250 mg/l) within 24 h. further enhancement of the culture conditions involving agitation, temperature, ph, inoculums volume and salinity was carried out using response surface methodology (rsm) based on central composite design (ccd). the ccd optimizations allowed the interactions among the culture conditions which eventually resulted in 100% degradation in each of the phenanthrene and pyrene thereby released non-hazardous metabolites. correlation between the predicted and actual results further validated the ccd optimization. the phenanthrene metabolites identified were 3,4-dihydroxyphenathrene, phthalate, pyruvic acid and acetic acid. pyrene metabolites identified involved pyrene *cis*-4,5-dihydrodiol, 3,4-dihydroxyphenathrene, phthalate, pyruvic acid, acetic acid and formic acid. the biodegradation experiments were finally validated using numerical optimizations. *enterobacter* sp. mm087 was found to rapidly degrade 500 mg/l phenanthrene and 250 mg/L pyrene within 24 h which makes it a very efficient and rapid PAHs degrader.

Keyword: Phenanthrene; Pyrene; Biodegradation; *Enterobacter* sp. MM087; Optimization