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BIOREMEDIATION OF PETROLEUM SLUDGE UNDER ANAEROBIC MICROENVIRONMENT: INFLUENCE OF BIOSTIMULATION AND BIOAUGMENTATION

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Abstract

Bioremediation is considered as one of the prominent and cost-effective cleanup technology to treat oily sludge disposals. In the present investigation anaerobic bioremediation of petroleum based oily sludge was studied in a slurry reactor by applying different experimental strategies viz., bioaugmentation, biostimulation and co-substrate addition. Total petroleum hydrocarbons (TPH) present in the oily sludge before and after degradation was extracted using soxhlet extraction procedure. The soluble fractions of TPH were eluted using column chromatography. Integrated process documented higher degradation efficiency. The combination of biostimulation, bioaugmentation and co-substrate addition showed efficient degradation of TPH (38.39%), aromatics (50.99%), aliphatics (44.48%), asphaltenes (29.62%) and NSO (nitrogen, sulphur and oxygen) compounds (15.23%). This condition was followed by biostimulation and bioaugmentation (36.89%) and individual operation of bioaugmentation (29.38%). Individual polycyclic aromatic hydrocarbons (PAHs) also showed good degradation pattern where, highest was observed with naphthalene (97.8%) followed by acenaphthylene (92.5%), fluorene (91.2%), anthracene (89.6%), phenanthrene (89.1%), fluoranthene (88.5%), pyrene (88.5%), benzo (A) anthracene (87.9%), chrysene (87.1%), benzo (A) pyrene (70.2%), dibenzo (A, H) anthracene (64.2%), benzo (G, H, I) perylene (49.5%). In all the reactors, degradation of lower ring compounds is significantly noticed compared to the higher ring compounds.

Key words: anaerobic treatment, domestic sewage, oily sludge, polycyclic aromatic hydrocarbons, biostimulation, total petroleum hydrocarbons

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