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Effects of activated carbon amendment time on crude oil bioremediation in soil

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Statement of the Problem: The use of activated carbon (AC) amendments to reduce the effects of hydrophobic contaminants is an innovative soil remediation approach and has gained attention in the clean-up of soil polluted with PAHs, and other hydrophobic organic compounds (HOCs), due to alleged financial and environmental benefits. However, AC amendment side-effects on crude oil pollution biodegradation are not well understood. Some previous reports have shown deleterious effects of AC on indigenous soil HOCs while other reports have shown improved microbial numbers as well as an optimized fungi/bacteria gene copy number ratio following activated carbon addition

Methodology: The impact of activated carbon (AC) amendments on the biodegradation of crude oil in soil was studied in batch microcosms using 5% soil wet weight AC amendments, if added from the beginning or after five months, on the outcomes of one year of crude oil polluted soil bioremediation

Findings: CO_2, residual hydrocarbon concentrations and microbial community structure analysis revealed how AC amendment hindered crude oil biodegradation much more when added from the start. AC amendment at the beginning and after 5 months respectively reduced and slightly reduced the abundance of hydrocarbon degraders belonging to Actinobacteria and classes Gammaproteobacteria and Alphaproteobacteria (Such as Rhodococcus, Marinobacter, and Parvibaculum) in crude oil batches.

Conclusion & Significance: AC amendment from the start had the highest alkane and total US EPA PAH residues, but was more effective than one year of bioremediation, with or without AC amendment after 5 months, in reducing PAH availability in the soil.

Recent Publications

1. Igun O, et al (2019) Impacts of activated carbon amendments, added from the start or after five months, on the microbiology and outcomes of crude oil bioremediation in soil. International Biodeterioration & Biodegradation, 142:1-10
2. Igun O, et al (2019) Ethanol and biodiesel impact on the microbial ecology of toluene biodegradation in soil for variable nutrient availability. (Manuscript completed)
3. Igun O, (2017) Employing the power of DNA-based microbial community structure analysis for the rational design of hydrocarbon contaminated soil remediation- Thesis (Newcastle University)

Biography

Researcher & an experienced Interdisciplinary project manager with expertise in application of molecular biology and analytical chemistry techniques in contaminated site investigation and remediation strategies. Passionate about improving pollution/waste management strategies by making them more sustainable for the future and economically viable, with minimal disruption to the environment. Research interest includes isolation, identification and characterization of microorganisms with a view to developing them for applied commercial applications these include the isolation of microbes with the potential to produce high value compounds including anti-cancer drugs and antimicrobial compounds, the development of microbial fuel cells, bioremediation, wastewater treatment and molecular diagnostics