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Bio-surfactant from *Paenibacillus dendritiformis* and its application in assisting polycyclic aromatic hydrocarbon (PAH) and motor oil sludge removal from contaminated soil and sand media

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A novel bio-surfactant was produced by strain CN5, identified as *Paenibacillus dendritiformis* isolated from creosote contaminated wood treatment plant soil. The bio-surfactant produced by the strain was identified as lipopeptidal after Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR), Thin-layer chromatography (TLC), and Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS) analysis. The MS/MS analysis of the bio-surfactant showed that it has amino acid sequence of Cys-Gly-Ala-Gly-Ile-Asn-Leu and a long chain fatty acid of molecular mass 522 Da. The bio-surfactant exhibited 74% and 82% Emulsification Index (E_{24}) with hexane and cyclohexane, respectively, and it showed high thermal, pH and saline stability over wide range of temperature, pH and salinity. The ability of the bio-surfactant to desorb PAH from spiked soils and motor oil from spiked sands were tested in batch experiments and it desorbed more than 96% of phenanthrene, 83% of pyrene from the contaminated soil in 5 days and 81% of heavy used motor oil sludge from the spiked sands in 24 hrs. This suggests the potential application of the bio-surfactant for the removal of PAHs and motor oil sludge from contaminated media and enhancing their bioremediation by increasing bioavailability and possible application of the bio-surfactant for enhanced oil recovery.

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Producing advantaged biofuels for high efficiency engines

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The world desires both higher efficiency engines and lower Green-House Gas (GHG) emitting biofuels. To achieve these goals a large number of countries have passed provisions that require higher efficiency engines and lower GHG fuels. Unfortunately, these provisions have largely been developed independent of each other and can conflict with each other. For example, the requirement to blend in ethanol at the 10% level into gasoline in the US decreases the distance traveled per volume basis (km/l) in current spark ignition engine powered cars due to the lower energy content of ethanol. A better approach would be to develop biofuels that as a minimum maintain status quo with current gasoline, diesel and jet fuels but ideally allow for higher engine and thus vehicle efficiencies. This talk will discuss some possibilities for producing biofuels that look promising for being superior to current gasoline, diesel and jet fuels for use in the next generation of higher efficiency heavy duty engines.

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