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ANALYSIS OF THE BIOREMOVAL OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) IN WATER BY SPME-GC/MS

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Abstract: Pollution of freshwater ecosystems with persistent organic pollutants (POPs) is a global problem. Polycyclic aromatic hydrocarbons (PAHs) are a group of POPs generated primarily during the incomplete combustion of organic materials. These chemical compounds adversely affect human health as well as the environment. The International Agency for Research on Cancer has classified some PAHs as human cancerogenic. Also, the USEPA included the PAHs: pyrene, phenanthrene and naphthalene within the 16 priority compounds of special concern for their toxicological effects. The use of microorganisms with specific characteristics is an alternative to reduce the levels of PAHs in water. The objective of this study was to evaluate the bioremoval of PAHs: pyrene, phenanthrene and naphthalene in water samples using a consortium from a sediment mining sample. In a first step, the microbial consortium was stabilized by performing enrichment every month during six months. In this process, carbon sources (yeast extract) were replaced for the PAHs to force the microorganisms to use only the PAHs as the main source of carbon. In the second step, the bioremediation of the PAHs was measured using the analytical technique of solid phase micro extraction, followed by Gas Chromatography coupled to mass spectrometer (SPME-GC/MS). Abiotic controls were included to assure the analysis. The RSD of <20% was monitored with Chrysene-d12 as the internal standard. SPME blanks were ran every 10 samples and none showed a PAHs response. The PAHs recovery for all the analytes was reported in a range of 84-90%. It was observed that as the PAHs concentration increased, the consortium showed more stability removing up to 98.99% of PAHs in the water. The results revealed that PAHs: pyrene, naphthalene and phenanthrene can be removed up to 90% in water in 14 days using a consortium from a sediment mining.

Key Words: Biodegradation, GC/MS, POPs, Solid phase micro extraction, water pollution.

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