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FIBERBANKS AS SUBSTRATE AND FEEDSTOCK FOR BIOLOGICAL REMEDIATION: A PRACTICAL ANALYTICAL METHOD DEVELOPMENT FOR ORGANIC POLLUTANTS ANALYSIS

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Abstract
Fiberbanks from the pulp and paper industry are typically contaminated with a wide range of chlorinated aromatic and aliphatic toxins such as HCB and other chlorinated benzenes, PCB, HCH, DDT, PCDD, PCDF and Chlorophenols. This poses a formidable challenge for the analyst to develop appropriate analytical methodology for the monitoring of the progress of remediation.

In preparation to this undertaking, an examination of a practical analytical method using one extraction method, one clean-up and one analysis method for the aforementioned target compounds found in the fibrous sediment. This method was performed using accelerated solvent extraction (ASE), a modified silica gel column and GC-FID/ECD.

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Additionally, an assessment of the levels of organic pollutants was conducted, with the purpose of measuring the potential alteration in contaminants when freeze-drying, air-drying and autoclaving pretreatments are applied to the sediment samples, prior to be used as a media for biological remediation.

The results showed that the ASE is a very fast and reliable method of extraction, with yields comparable or higher than the reference Soxhlet extraction method. The activated silica gel column demonstrated adequate purification of the sediment extract for analysis using the two detectors, FID and ECD, which were able to identify the target analytes from only one purified extract. The method employed in this study has the potential to reduce both processing time and material used for analytical sample preparation. Lastly, some modifications in concentrations and distribution of target analytes were revealed in the sediments pre-treated by autoclave and air-dried when compared with the freeze-dried sediments, which can help understanding the development of the biological remediation process.

Keywords: Biological remediation, contaminated sediment, fiberbank, DDT, PCBs, PAH, accelerated solvent extraction