



Preparation of micro- and nano-emulsions of soybean oil and removal of sorbed phenanthrene from sandy soil

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ABSTRACT

Soybean oil was used as a biodegradable extracting agent for the removal of sorbed phenanthrene (PHE) in sandy soil. In this study, several methods of forming emulsions using soybean oil and their extraction properties were investigated. The stable and homogeneous oil emulsions were formed more effectively by ultrasonication (U1) than by homogenization (H1). Moreover, homogenization before ultrasonication (HU1) established more stable emulsions than U1 alone. The mean diameter of oil droplets in U1 or HU1 was reduced to the nanometer range (approximately 70 nm) by U1 with 750 W using a high-power sonic tip operated at 33% amplitude and 20 kHz frequency for 5 min. The extraction efficiency of sorbed PHE from soil by oil emulsions increased with decreasing size of droplets of oil emulsions; the maximum extraction of PHE was achieved with HU1. Thus, nano-emulsions of vegetable oil made by U1 could be an environmentally benign alternative for effectively washing soil.

Keywords: Emulsion; Phenanthrene; Soil washing; Soybean oil; Ultrasonication

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