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Book review

Phytoremediation of Hydrocarbon-Contaminated Soil, Stephanie Fiorenza, Carroll L. Oubre, and C. Herb Ward, (Eds.), CRC Press, Boca Raton, FL, 2000, 164p. $64.95, ISBN 1-56670-463-4.

This book reports the results of a significant investigation of phytoremediation of hydrocarbon-contaminated soil. The results of laboratory, greenhouse and field research are presented. The investigators and authors of the reported research are M.K. Banks, R.S. Govindaraju, A.P. Schwab, and P.A. Kulakow. The laboratory and greenhouse investigations where conducted at Kansas State University; the field study was carried out at the Navy's largest US fuel storage facility, the Craney Island Fuel Terminal in Portsmouth, VA.

The beneficial effects of vegetation in contaminated soil have been the subject of numerous investigations during the last 10 years. The results reported in this book are a significant addition to the literature. In this work, a shaking extraction method was developed for analysis of petroleum compounds in soil. Greenhouse studies were conducted to evaluate the fate of benzo(*a*)pyrene and other petroleum contaminants in vegetated systems. The field investigation demonstrated that vegetation is beneficial in the remediation of hydrocarbon-contaminated soil.

The shaking method for extraction of petroleum hydrocarbons from soil was developed because of a need for a faster and more efficient method than the soxhlet extraction protocol (EPA Method 3540A). The results from the shaking method are acceptable, and it is significantly faster and uses less solvent.

In one of the greenhouse investigations, the degradation of antharacene, benzo(*a*)anthracene, benzo(*a*)pyrene, and diesel fuel was followed. Biodegradation was examined at three different depths. In general the top and middle soils showed greater rates of transformation than the bottom portion of the 24 in. of soil. The availability of oxygen may have influenced the results. Microbial numbers where higher in vegetated columns after 7 weeks compared to the unvegetated columns. After the contaminant concentration decreased in the upper layers, the microbial numbers at 14 weeks were lower than at 7 weeks. After 21 weeks, benzo(*a*)anthracene and benzo(*a*)pyrene showed significantly higher biodegradation in the vegetated columns compared to the unvegetated columns in the bottom layer of soil.

In the field study, there was a statistically significant reduction of total petroleum hydrocarbons (TPH) in the vegetated plots compared to the unvegetated plots. White

clover showed the highest TPH degradation rate with about 50% degradation in 24 months. Degradation appeared to be continuing at the end of the 24 month study. No leaching of TPH from the zone of contamination was observed. Microbial numbers and diversity were initially higher in the vegetated plots.

The second part of the book is a technology design and evaluation of phytoremediation by John Finn. This portion includes cost information, desired site characteristics, and applicable contaminants.

There is great interest in phytoremediation because of its effectiveness, low cost and simplicity. This book provides detailed information on both greenhouse and field studies that are significant developments in that they add to the knowledge base that is essential to the advancement and commercialization of the technology.

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