

# BIOREMEDIATION OF SURFACE AND SUBSURFACE CONTAMINATION<sup>a</sup>

*Editors and Conference Organizers*

RAKESH K. BAJPAI AND MARK E. ZAPPI

---

## CONTENTS

---

Foreword. <i>By</i> RAKESH K. BAJPAI AND MARK E. ZAPPI .....	ix
Preface. <i>By</i> RAKESH K. BAJPAI AND MARK E. ZAPPI .....	xi
Sequestration and Realistic Risk from Toxic Chemicals Remaining after Bioremediation. <i>By</i> M. ALEXANDER, P. B. HATZINGER, J. W. KELSEY, B. D. KOTTLER, AND K. NAM .....	1
Moving Innovative Biotechnologies to the Field: An Engineering Perspective. <i>By</i> M. J. RYAN AND G. GANAPATHI .....	6
Roadblocks to the Implementation of Biotreatment Strategies. <i>By</i> J. W. TALLEY AND P. M. SLEEPER .....	16
An Overview of Research on the Beneficial Effects of Vegetation in Contaminated Soil. <i>By</i> L. E. ERICKSON .....	30
Bioavailability and Biodegradation Kinetics Protocol for Organic Pollutant Compounds to Achieve Environmentally Acceptable Endpoints during Bioremediation. <i>By</i> H. H. TABAK AND R. GOVIND .....	36
Effect of Some Common Solubility Enhancers on Microbial Growth. <i>By</i> J. GU, G. W. PRECKSHOT, S. K. BANERJI, AND R. K. BAJPAI .....	62
Principle of Superposition Applied to Adsorption Experiments to Differentiate Strong Binding Mechanisms. <i>By</i> W. D. BURGOS .....	74
Treatment of Trichloroethylene-contaminated Water with a Fluidized-bed Bioreactor. <i>By</i> R. L. SEGAR JR., S.-Y. LEUNG, AND S. A. VIVEK .....	83

<sup>a</sup> The papers in this volume resulted from a conference entitled **Bioremediation of Surface and Subsurface Contamination** held on January 21–26, 1996 in Palm Coast, Florida by the Engineering Foundation.

Complete Reductive Dechlorination of Trichloroethene by a Groundwater Microbial Consortium. By D. G. BOLESCH, R. B. NIELSEN, AND J. D. KEASLING.....	97
Biotreatment of PAH-contaminated Soils/Sediments. By E. J. BOUWER, W. ZHANG, L. P. WILSON, AND N. D. DURANT .....	103
Microbial Degradation and Treatment of Polycyclic Aromatic Hydrocarbons and Plasticizers. By R. KURANE.....	118
Kinetics of BTEX Degradation by a Nitrate-reducing Mixed Culture. By D. SZYKOWNY AND J. D. KEASLING.....	135
Evaluation of Bioslurry Ecosystems for Removal of TNT from Contaminated Soil Using a Variety of Process Amendments. By S. D. HARVEY, H. L. FREDRICKSON, W. E. EVANS, M. E. ZAPPI, AND D. O. HILL.....	142
Bioremediation Using Composting or Anaerobic Treatment for Ordnance-contaminated Soils. By E. TUOMI, M. P. COOVER, AND H. F. STROO ...	160
Screening of Aquatic and Wetland Plant Species for Phytoremediation of Explosives-contaminated Groundwater from the Iowa Army Ammunition Plant. By E. P. H. BEST, M. E. ZAPPI, H. L. FREDRICKSON, S. L. SPRECHER, S. L. LARSON, AND M. OCHMAN .....	179
Fate of Explosive Contaminants in Plants. By S. L. LARSON.....	195
A Microcosm Study on Remediation of Explosives-contaminated Groundwater Using Constructed Wetlands. By F. J. SIKORA, L. L. BEHREND, W. D. PHILLIPS, H. S. COONROD, E. BAILEY, AND D. F. BADER .....	202
Recent Developments in Formulating Model Descriptors for Subsurface Transformation and Sorption of Trinitrotoluene. By T. E. MYERS AND D. M. TOWNSEND.....	219
Application of Continuous Culture Technology for the Development of Explosives-degrading Microorganisms. By D. GUNNISON, H. L. FREDRICKSON, D. L. KAPLAN, A. L. ALLEN, C. M. MELLO, J. E. WALKER, G. MYRICK, W. E. EVANS, AND M. OCHMAN.....	230
Regulation of Intracellular Toxic Metals and Other Cations by Hydrolysis of Polyphosphate. By J. D. KEASLING .....	242
Microbial Migration in Soil: Influence of Sodiumhexametaphosphate. By C. KOEPEL, M. POPOVIC, AND R. K. BAJPAI .....	250
Sequential Electron Acceptor Model for Evaluation of <i>in Situ</i> Bioremediation of Petroleum Hydrocarbon Contaminants in Groundwater. By J. S. BRAUNER AND M. A. WIDDOWSON.....	263

Transport and Survival of a Genetically Engineered <i>Pseudomonas cepacia</i> Strain in Soil Columns during Wet/Dry Cycles. By M. V. CATTANEO, C. MASSON, AND C. W. GREER.....	280
Composting as a Reactor Design Problem: Modeling and Experiment. By N. J. LYNCH, K. L. GERING, AND R. S. CHERRY .....	290
Bioreactors for Soil and Sediment Remediation. By S. K. BANERJI .....	302
Bioventing Pilot Test Results at the Low Point Drain Area, Offutt AFB, Nebraska. By F. T. WERNER, J. E. WALTERS, AND G. B. KEEFER.....	313
First Production-Level Bioremediation of Explosives-contaminated Soil in the United States. By D. D. EMERY AND P. C. FAESSLER .....	326
Index of Contributors .....	341

The New York Academy of Sciences believes it has a responsibility to provide an open forum for discussion of scientific questions. The positions taken by the participants in the reported conferences are their own and not necessarily those of the Academy. The Academy has no intent to influence legislation by providing such forums.