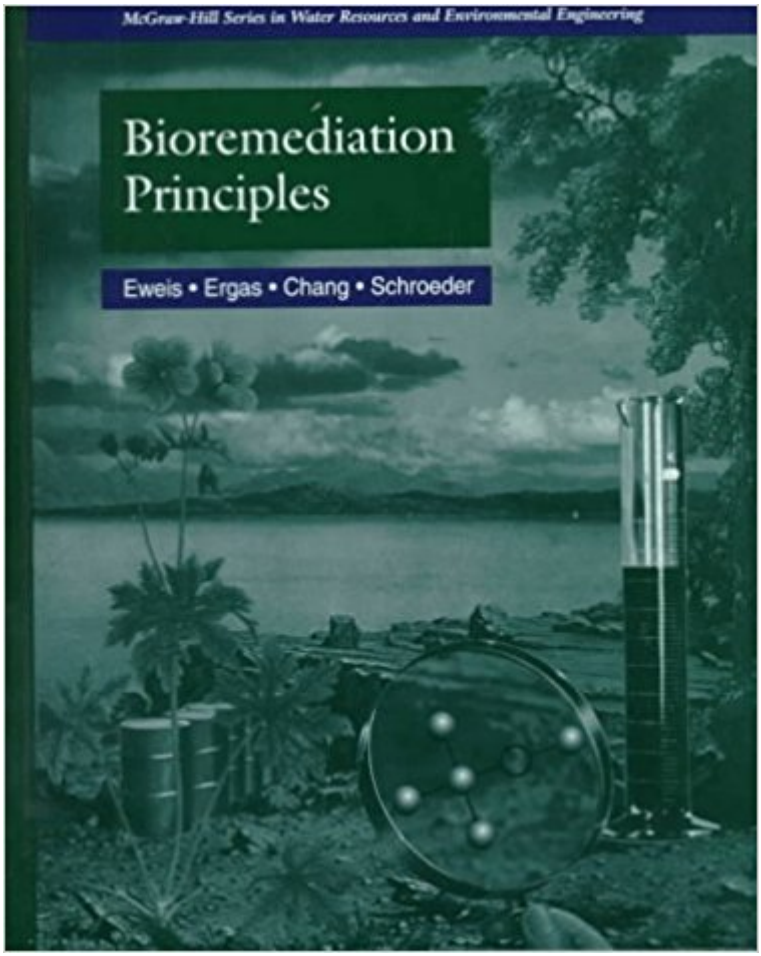
Bioremediation Principles



Synopsis

The use of biological methods and processes for the remediation of contaminated soils and aquifers is the focus of this text, which emphasizes the characteristics of organic compounds and factors which make organics amenable to biological treatment.

Book Information

Series: McGraw-Hill Series in Water Resources and Environmental Engi

Hardcover: 296 pages

Publisher: McGraw-Hill Companies (January 5, 1998)

Language: English

ISBN-10: 0070577323

ISBN-13: 978-0070577329

Product Dimensions: 9.6 x 7.6 x 0.7 inches

Shipping Weight: 1.4 pounds

Average Customer Review: 3.7 out of 5 stars 3 customer reviews

Best Sellers Rank: #842,567 in Books (See Top 100 in Books) #51 inÂ Books > Engineering & Transportation > Engineering > Civil & Environmental > Environmental > Groundwater & Flood Control #208 inÂ Books > Engineering & Transportation > Engineering > Civil & Environmental > Environmental > Waste Management #249 inÂ Books > Engineering & Transportation > Engineering > Civil & Environmental > Environmental > Pollution

Customer Reviews

I used this book for my MS course I took on bio-remediation. The flow of the book is good and easy to understand.

My problem with this book is that the review questions at the end of each chapter use terminology and concepts that are not introduced in the chapter’s text. Often the concepts in the text are referred to with different terminology in the questions, making them unnecessarily confusing. For example, in 2.3 "particle density" is used to refer (I assume) to the concept of "solids density" presented in the chapter. Also in the same problem, the concept of "air-filled porosity" is used but is not presented anywhere else in the text. There are many such examples to be found. I found myself wondering if this were a ploy to force people to buy the solutions manual.

These University of California, Davis, professors have provided a most useful addition to

remediation study resources with this text. They designed it for use in an introductory course on remediation of soil and groundwater contaminated by organic compounds. Petroleum compounds are a prime example of those organics. The text has been "vetted" by environmental engineering students at Davis over a five-year period. The NST/Engineers, Inc. reviewers consider knowledge of bioremediation principles to be a requirement of students in environmental science or engineering. This book is an excellent choice as a study text or as a reference for practicing engineers. Problems, discussion questions, and references follow each chapter. Sample problems are worked-out within the chapters.Following an introductory overview, the authors cover background material in five chapters. The soil environment is explained. A triangular soil classification graph displays the classes of soil texture, rated according to the proportions present of sand, clay, and silt. Additionally, the authors treat the effects of soil gases, moisture, porosity and other factors on the fate (destruction or preservation) and transport of contaminants through soil bodies. Methods are presented for calculating the distribution of organics between soils and liquids, and between liquids and vapors. The use of Henry's Law is featured for the latter. (Incidentally, a recent reference that will be helpful in providing measured data and best estimates for transport and physical properties of representative organics is "Chemical Properties Handbook" by Carl L. Yaws (McGraw-Hill, 1999).)Two chapters, "Microbial Ecology" and "Metabolism and Energy Production", provide basic information on types of microorganisms, stimulating cell growth, and maintaining cell health. This emphasis on biological basics highlights the greater contemporary importance of biological than chemical and other methods of destruction of organic contaminants in soils. Attention is focused on bacteria, the most abundant group of microorganisms in soil and groundwater; also the group that plays the major role in biodegrading toxic and otherwise offensive organic contaminants.A chapter is devoted to the chemical reactions occurring during biodegradation, such as oxidation, hydrolysis, bond rupture, and dehalogenation.In the final four chapters, the authors explain the engineering tasks involved in applying the fundamental principles covered in the earlier chapters. They describe the characteristics of in-situ treatment, and then solid-phase, slurry-phase, and vapor-phase bioremediation. In-situ treatment can be highly favored over removal of soil or water to an off-site location for treatment because of economic, schedule, logistic, and other constraints. Providing balance, the inherent difficulties of in-situ work are also covered. There are always some uncertainties about: subsurface soil structure, water bodies, and contaminant distribution. Factors involved in the major remediation methods of: "pump, treat, and injection", "air sparging", and "bioventing" are covered.A chapter on "Solid Phase Bioremediation" covers the landfarming (spreading soil to be treated no more than a few feet deep over large land areas) and composting

options. In composting systems, various types of covered piles of contaminated soils are maintained with control of nutrients, moisture, oxygen content, and temperature. "Slurry Phase Bioremediation" is something like stirred-tank reactor processing in the chemical industry with microbes replacing catalysts. Microbes and their nutrients, and catalysts and their supports, must be carefully chosen. With proper operation to prevent microbe death and catalyst poisoning or deactivation, both materials may be used in the next batch or in continuous operation. The reactors are large, enclosed, storage tanks provided with feed and discharge ports, agitation, and temperature control. Slurry phase work is also shown to be amenable to existing uncovered, lagoons when contaminant volatilization is not a problem. Floating agitators have been used in those cases.The last chapter describes, and provides designs and parameters for, "Vapor Phase Biological Treatment". VOCs are almost always present in the off-gases of soil or groundwater treatment. The authors summarize the pros and cons of currently used vapor-phase pollution control technology, such as adsorption and thermal and catalytic oxidation. They then present the case for "biofilters" or "biotrickling" filters. The former has microbes kept alive with nutrients and supported on various kinds of media. Off-gas vapors are blown in at the tower bottom, pass through the media, and exit at the top. The latter differs in that water spray is added at the top and nutrient solution is collected at the bottom and is recycled to the top. In either case, operation must control plugging of the media and thereby prevent a high vapor delta P through the column.A useful Appendix table provides properties, including Henry’s Law constant at 20 deg.C, for about 80 organics currently found in hazardous wastes.

GAAP: Interpretation ... of GenerallyAccepted Accounting Principles) Florida Real Estate Principles, Practices & Law (Florida Real Estate Principles, Practices and Law) Florida Real Estate Principles, Practices and Law, 33rd Edition (Florida Real Estate Principles, Practices & Law) Principles of Neural Science, Fifth Edition (Principles of Neural Science (Kandel)) Principles and Practice of Psychiatric Nursing, 10e (Principles and Practice of Psychiatric Nursing (Stuart)) Rastafari; Beliefs & Principles: Rasta beliefs & Principles about Zion and Babylon and the Bible General Principles of Law and International Due Process: Principles and Norms Applicable in Transnational Disputes (Cile Studies)