

Book review

Green materials for sustainable water remediation and treatment

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Green materials for sustainable water remediation and treatment is a good survey of known methods for removing metals from wastewater. In addition, there is a chapter about the role of biofilms in maintaining balance in aquatic ecosystems, and a chapter covering several methods for dye removal.

Anyone looking for an introduction to water remediation would be well served by reading this book. Each chapter covers a different sustainable method for water treatment. A general survey of several plant and chemical based methods is covered in Chapter 2. Several chapters cover the use of plant material for water treatment, from non-aquatic biomass, such as sugar beet bark and sunflowers, to polysaccharides from sources like ocra and chitosan, to biofilms and algae. There are also chapters on Zeolites, Silica Gels, and other Nanomaterials like carbon nanotubes and single enzyme nanoparticles. Because Ionic Liquids can be used in place of volatile organic carbon solvents, there is a chapter about the use of ionic liquids for extraction of metals from wastewater.

Each chapter introduces all of the methods that will be covered, along with a list of examples for use, and detailed coverage of the technical limits and success of each method. Each chapter contains at least 50 literature references. In some cases, there are 100 or more references. References range from proceedings of Mineralogical Society of America and *Chemosphere* to the *Journal of Hazardous Materials* and *Environmental Science*

Technology. References cover discussion of particle technology, reaction kinetics, and thermodynamic concepts.

Several of the chapters offer diagrams that help to illustrate the concepts discussed. The diagrams showing the distribution or change of charge density are helpful additions to the concepts presented. These diagrams can be found in the discussion of the use of polysaccharides, and in the use of surfactants with zeolites. Over 30 chemical structures of functionalized silica gels used for metal chelation are shown, and a table of functional groups for scavenging various metals is included.

The editors emphasize the importance of water treatment, for human survival and quality of life, in the introduction of the book. The need for sustainable water treatment, as populations continue to grow, and economies develop, is repeated in all of the chapters. Some of the nanotechnologies, biomass and natural polysaccharides discussed have not been tested at large scale. Many of the contributors suggest that further testing is urgently needed to find cost effective alternatives on a larger scale. The need for effective water treatment is global, but local needs and conditions vary. A variety of solutions are needed to serve different local needs. Perhaps more collaboration, through technical society networks, can help to accomplish this.

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