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Nota di contenuto	Preface -- Part I Reductive Technologies -- Geochemical Principles of Reductive Remediation Processes -- Nanoscale Zero-Valent Iron Particles for Water Treatment: from Basic Principles to Field-Scale Applications -- Other Chemical Reductive Methods -- Combination of Electrokinetics and nZVI Remediation -- Field Study I: In Situ Chemical Reduction Using Nanoscale Zero-valent Iron Materials to Degrade Chlorinated Hydrocarbons -- Field Study II: Pilot Application of nZVI/DC-combined Methods at Aargau Site -- Part II Oxidative Technologies -- Introduction to Oxidative Technologies for Water Treatment -- Ferrates as Powerful Oxidants in Water Treatment Technologies -- Radical Reactions and Their Application for Water Treatment -- Photo-oxidation Technologies for Advanced Water Treatment -- The Use of Nanomaterials in Electro-Fenton and Photoelectro-Fenton Processes -- Field Study III: Evidence Gained from Site Studies for the Performance of Ferrate(VI) in Water and Wastewater Treatment -- Field Study IV: Arsenic Removal from Groundwater by Ferrate with the Concurrent Disinfecting Effect—Semi-pilot on-site

Application -- Field Study V: Combined Oxidation Technology using Ferrates (FeIV–VI) and Hydrogen Peroxide for Rapid and Effective Remediation of Contaminated Water—Comprehensive Practically Focused Study -- Part III Biotechnologies for Water Treatment -- Biotechnologies for Water Treatment -- Enzyme-Based Nanomaterials in Bioremediation -- Bioelectrochemical Processes for the Treatment of Oil-Contaminated Water and Sediments -- Field Study VI: The Effect of Loading Strategies on Removal Efficiencies of a Hybrid Constructed Wetland Treating mixed Domestic and Agro-Industrial Wastewaters -- Field Study VII: Field Study of Three Different Injectable Oxygen Sources to Enhance Mono-Aromatic Solvents in situ Biodegradation -- Field Study VIII: Nano-bioremediation: nZVI for Inorganic and Organic Contamination -- Part IV Biotechnologies for Soil Treatment -- Biotechnologies for Soil Treatment -- Mycoremediation of Contaminated Soils -- Composting Practices for the Remediation of Matrices Contaminated by Recalcitrant Organic Pollutants -- Modern Bioremediation Approaches: Use of Biosurfactants, Emulsifiers, Enzymes, Biopesticides, GMOs -- Field Study IX: Pilot-Scale Composting of PAH-Contaminated Materials—Two Different Approaches -- Field Study X: Oil Waste Processing Using Combination of Physical Pretreatment and Bioremediation -- Part V Ecotoxicology of Both Environmental Pollutants and Nanomaterials Used for Remediation -- Ecotoxicology of Environmental Pollutants -- Ecotoxicity of Nanomaterials Used for Remediation -- VI Future Prospects -- Future Prospects for Treating Contaminants of Emerging Concern in Water and Soils/Sediments -- Part VII Technical Chapters.-Tool I: Characterization of nZVI Mobility in 1D and Cascade Columns by Ferromagnetic Susceptibility Sensor -- Tool II: Membrane Interface Probe -- Tool III: Fracturing for Enhanced Delivery of In situ Remediation Substances in Contaminated Sediments -- Tool IV: Monitoring of nZVI Migration and Fate in the Groundwater Conditions -- Tool V: Microbiological Methods for Monitoring nZVI Performance in Groundwater Conditions.

Sommario/riassunto

This edited work presents a comprehensive treatise on the latest progress in the field of selected innovative nanotechnologies, biotechnologies, and their possible combinations for efficient elimination of a broad range of pollutants from various types of water and soil. It covers the underlying principles of all the key technologies (reductive and oxidative technologies for water treatment and biotechnologies for water and soil treatment). Moreover, it includes toxicological evaluation of emerging pollutants and novel engineered nanoparticles, as well as providing results of field-scale verification and application of the most promising technologies. Central aspects covered in this book include: geochemistry of iron, properties of iron nanoparticles (nZVI) and related materials for water treatment, in situ methods for groundwater treatment, evaluation of various combined nano/bio technologies, mechanisms and efficiencies of degradation/dechlorination of chlorinated hydrocarbons (aswell as other organic pollutants like POPs, PAHs, etc.), elimination of arsenic and Cr(VI) from water, advanced oxidation processes with a strong focus on high-valent states of iron (ferrates), radical reactions, photooxidation, Fenton reactions, disinfection, and biodegradation including mycoremediation and composting of a wide range of pollutants from water and soil. In addition, technical details of selected strategies adopted for a pilot/full-scale application of key nano-/biotechnologies, i.e. nZVI injection into groundwater, field-scale contaminant monitoring, nanoparticle migration, and microbiological methods for monitoring nZVI performance in groundwater conditions, are presented. Therefore, this multidisciplinary book will be suitable for

a broad readership including environmental scientists, practitioners, policymakers, toxicologists, and, of course, students of diverse fields such as materials science, chemistry, biology, geology, hydrogeology, engineering, etc.