

Electrochemistry for the Environment

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Editors

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Preface

Wastewater treatment technology is undergoing a profound transformation due to the fundamental changes in regulations governing the discharge and disposal of hazardous pollutants. Established design procedures and criteria, which have served the industry well for decades, can no longer meet the ever-increasing demand.

Toxicity reduction requirements dictate in the development of new technologies for the treatment of these toxic pollutants in a safe and cost-effective manner. Foremost among these technologies are electrochemical processes.

While electrochemical technologies have been known and utilized for the treatment of wastewater containing heavy metal cations, the application of these processes is only just a beginning to be developed for the oxidation of recalcitrant organic pollutants.

In fact, only recently the electrochemical oxidation process has been recognized as an advanced oxidation process (AOP). This is due to the development of boron-doped diamond (BDD) anodes on which the oxidation of organic pollutants is mediated via the formation of active hydroxyl radicals.

In this volume, our goals are to first lay down the fundamentals involving the environmental electrochemistry, introducing the basic techniques in selecting the electrode materials and fabricating them, followed by the theoretical analysis of the electrochemical processes, the green electrochemical operation, discuss about the electrochemical technologies in water/wastewater treatment using BDD, and then examine the established wastewater treatment technologies such as electrocoagulation and electroflootation. The electrochemical reduction technologies are discussed in two chapters with main focus on the treatment of halogenated compounds. Electrooxidation using Ti/SnO₂ has received lots attention in the past decades, one chapter is devoted to this topic. One chapter discusses about the treatment of wet sludge, a type of waste to generate along with the water/wastewater treatment development. The emerging technologies based on solar energy are analyzed toward the end of the book with a closing chapter on using both redox half-reactions, reduction and oxidation in wastewater treatment.

We are grateful to the contributors from eight countries in Asia, Europe, and North America. We hope this collective work of internationally renowned experts on electrochemical technologies can help the environmental engineers, academic

researchers, and environmental protection officials/agencies to better protect our precious earth. We are confident that together people can preserve the natural environment for us and many generations to come!

Lausanne, Switzerland
Kowloon, Hong Kong

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