

Volume Preface

The ever-increasing shortage of water and the increasing needs for food security of the expanding world population and for irrigation water both in respect to good quality and quantity render the reuse a necessary condition. Currently, sustainable and safe urban water cycles have a high priority on the policy agenda of many countries around the world. Although reuse is accompanied by a number of benefits, several open questions still exist. For example, the applied treatments fail to completely remove biological and chemical microcontaminants, antibiotic-resistant bacteria, and resistance genes. The remaining organic matter in the wastewater after conventional treatment consists of a number of recalcitrant organic compounds including potential endocrine-disrupting compounds; many types of pharmaceutical compounds including antibiotics, disinfection by-products, personal care products, metabolites, and transformation products; and others. This leads to their subsequent release in the terrestrial and aquatic environment through disposal, storage, and reuse applications, which is of major environmental and health concern. Therefore, the identification of technologies that are able to remove such contaminants from wastewater, and the identification of means and solutions to overcome these problems and promote safe reuse practices, is of utmost importance.

Within the last decade much research has been performed in order to eliminate such contaminants present in low concentration (so-called micropollutants) from wastewater by appropriate treatment technologies. The newer ones are applied in addition to conventional treatment technologies. They are most often called “advanced treatment technologies”. These mainly include a chemical step such as ozonation, hydrogen peroxide and light-driven technologies, and/or application of adsorption materials as well as filtration processes or combinations of these, in order to remove contaminants from the water. Within the last years there has also been intense research investigating the applicability of such advanced treatment technologies not just for the removal of organic microcontaminants but also for the removal of microorganisms, including bacteria, antibiotic-resistant bacteria, protozoa, and viruses.

Much published material is currently available. However, it is often scattered in different journals and books and is available only among various scientific communities. Therefore, it is timely to bring together this knowledge. In this book the potential and the limitations as well as the pitfalls and the knowledge gaps of the different advanced treatment technologies are presented. This volume offers a detailed overview on the capacity of currently applied and tested treatment technologies and on the integration of advanced processes to remove trace organic contaminants and microorganisms. This book is expected to draw the attention of experts; scientists; practitioners, from various fields of research, including analytical and environmental chemistry, toxicology, and environmental and sanitary engineering; and also treatment plant operators and policy makers.

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