Preface

The publication of this book was prompted by the symposium on Current Status of Environmental Research on Water Contaminants at the spring meeting of the American Chemical Society in Orlando in 2019. A large number of speakers talked on a variety of contaminants in four sessions, and various posters were also presented. Many chapters presented here are based on the symposium. Some were eliminated because of insufficient interest, and other chapters were added to provide a better overall relevance on this subject.

Chapter 1 provides a brief overview of the subject. Chapter 2 covers origin, distribution, and implications for human exposure, and health of legacy and emerging contaminants in water. The contaminants discussed include pesticides, biocides, bisphenol analogues/ derivatives, derivatives, phthalates, perchlorates, perfluoroalkyl substances, flame retardants, pharmaceuticals, and personal care products. The current status of heavy metal contaminants and their removal and recovery techniques are detailed in Chapter 3. A review of microplastics in freshwater environments covers locations, methods and pollution loads in Chapter 4. Public disclosure of the presence of GenX, a perfluorinated ether carboxylic acid,and numerous other perfluorinated alkylated substances in drinking water from the Cape Fear River in North Carolina compelled wide-ranging environmental sampling for these emerging contaminants (Chapter 5). Emerging science demonstrates ecosystem-scale fluxes of these pollutants by several pathways that create a multidimensional regulatory and management challenge. Chapter 6 provides a comparative assessment of different types of disinfection systems. To achieve chemical safety along with microbiological safety of the treated water, it is important to consider harmful disinfection by-products that are formed during the treatment itself. This chapter presents advantages and disadvantages of various disinfection techniques. The effectiveness of bench-scale bubble diffuse aeration to reduce dichlorobromomethane, dibromochloromethane), and bromoform from disinfection processes was examined in Chapter 7. Differences in the percentage of THMs (trihalo methanes) removal were assessed, including the on their Henry's law constants. The removal efficiencies of these THMs from the initial concentration of 100 μg/L for air flow rate of 2 L/min were 99%, 97%, and 88%, respectively. Antibiotics are considered emerging micropollutants (Chapter 8). They are efficiently transmitted through wastewater treatment plants, leading to their widespread detection in rivers and streams. Ciprofloxacin is a commonly used antibiotic and is found throughout the environment. Its structure and binding are heavily influenced by pH. This chapter focuses on the influence of surfactants as well as the influence of pH on the binding of ciprofloxacin, using fluorescence spectroscopy. Chapter 9 describes more recently designed ligands that have been produced with the aim of determining how well they remove various pollutants from aqueous solutions. Oil and organic contaminants are major contributors to water pollution (Chapter 10). These contaminants are being added by frequent oil spills and by industrial and domestic activities. This chapter discusses various methods of preparation of superhydrophobic and superoleophilic meshes for oil and water separation. Hybrid multiphase adsorbents have recently received significant attention for As(III) remediation, because they can be used as a cheap and efficient adsorbent, thus helping nanomaterials avoid agglomeration and simultaneously adsorb other pollutants (Chapter 11). This chapter provides up-to-date research on the remediation of As(III), with particular regard to adsorption by biomass-based carbonaceous materials and their composites. Regenerated microfibrillated cellulose (R-MFC) fibers were isolated by a combination of dissolution and regeneration methodologies, using a mixture of phosphoric acid and ethanol for treatment on jute cellulose (Chapter 12). The isolated R-MFC fibers possessed high specific surface area (10 m^2/g), good aspect ratio (L/D=30), high thermal stability (T_{max}=352 °C) with a zeta potential of –8.4 mV, and a low crystallinity index of 47.5%. These R-MFC fibers were highly effective as support for the growth of ZnO nanocrystals. The R-MFC composite loaded with 41 wt% of ZnO nanocrystals was found to be highly efficient in removing arsenic (As(V)) ions from contaminated water, with the maximum capacity of 4,421 mg/g at neutral pH. This is significantly higher than the various absorbents reported for arsenic removal until now in the literature. Nitro-oxidized carboxycellulose nanofibers (NOCNF) were prepared from raw jute fibers using a one-step nitro-oxidation method, with a mixture of nitric acid and sodium nitrite (Chapter 13). The extracted NOCNF has shown that the high surface charge (–70 mV) and good carboxylate content (1.1 mmol/g). NOCNF is a highly efficient substrate that is used in order to eliminate a wide range (25 to 1,250 ppm) of UO_2^{2+} impurities from simulated water.

I would like to thank all of the experts for their contributions to this book, which are likely to be found very useful by various groups interested in research on water contaminants to assure good water quality.

March 25, 2020

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