Preface

The principle of adsorption and the ability of certain solid materials to remove dissolved substances from water have long been known. For about 100 years, adsorption technology has been used to a broader extent for water treatment, and during this time, it has not lost its relevance. On the contrary, new application fields, besides the conventional application in drinking water treatment, have been added in recent decades, such as groundwater remediation or enhanced wastewater treatment.

The presented monograph treats the theoretical fundamentals of adsorption technology for water treatment. In particular, it presents the most important basics needed for planning and evaluation of experimental adsorption studies as well as for process modeling and adsorber design. The intention is to provide general basics, which can be adapted to the respective requirements, rather than specific application examples for selected adsorbents or adsorbates. As a practice-oriented book, it focuses more on the macroscopic processes in the reactors than on the microscopic processes at the molecular level.

The book begins with an introduction into basic concepts and an overview of adsorption processes in water treatment, followed by a chapter on adsorbents and their characterization. The main chapters of the book deal with the three constituents of the practice-related adsorption theory: adsorption equilibria, adsorption kinetics, and adsorption dynamics in fixed-bed columns. Single-solute systems as well as multicomponent systems of known and unknown composition are considered. A special emphasis is given to the competitive adsorption of micropollutants and organic background compounds due to the high relevance for micropollutant removal from different types of water. The treatment of engineered processes ends with a chapter on the restoration of the adsorbent capacity by regeneration and reactivation. The contents of the book are completed by an outlook on geosorption processes, which play an important role in seminatural treatment processes such as bank filtration or groundwater recharge.

It was in the mid-1970s, at the beginning of my PhD studies, when I was first faced with the theme of adsorption. Although I have broadened my research field during my scientific career, adsorption has always remained in the focus of my interests. I would be pleased if this book, which is based on my long-term experience in the field of adsorption, would help readers to find an easy access to the fundamentals of this important water treatment process.

I would like to thank all those who contributed to this book by some means or other, in particular my PhD students as well as numerous partners in different adsorption projects.

Eckhard Worch
January 2012