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Fundamentals and Applications

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PREFACE

Adsorption is a separation process playing a fundamental role in several industrial areas, being used in both purification and bulk separations. The adsorbent used is the main parameter controlling the effectiveness of the process. Emerging new separations and the improvement of existing ones constitute the driving force for the development of new adsorbents with improved adsorbing properties. With this objective, recent research directions include the development of hybrid organic-inorganic and combined adsorbents.

These Combined and Hybrid Adsorbents have progressively found their place, gaining importance for adsorptive applications and, consequently, for economy. They encompass significant scientific advances, pointing to the development of some directions of modern technology in the near future. This is confirmed by the impressive growth of the number of scientific publications dedicated to the subject in the last few years.

The progresses in the development of these materials, the increased environmental and terrorism concerns, the needs for the integration between science and technology and the new analytical techniques available, enabling the complete characterization of these new materials, led us to the organization of a Research Workshop, aiming at making an up-to-date review of the latest achievements and an exchange of ideas between people working in several fields of this research area.

This volume includes the key lectures and participants’ contributions delivered at the NATO-funded Advanced Research Workshop Combined and Hybrid Adsorbents: Fundamentals and Applications, held in Pushcha-Voditsa, Kiev, Ukraine, from the 15th to the 17th of September 2005, and attended by 49 participants from 19 countries.

The purpose of the workshop was three-fold, according to the three parts in which this book is divided. The first part includes contributions reporting the dramatic progress in the field of hybrid organic-inorganic adsorptive materials prepared by sol-gel and template methods as well as their applications; special inorganic adsorbents and their applications, including the removal of radionuclides from nuclear waste effluents, are included in this first part. The second part concerns the synthesis, properties and applications of carbon and combined adsorbents, including enterosorbents for the effective elimination of toxic metals and radionuclides from the human organism; other organic adsorbents, including chitin and algal biomass, are included in the second part. Finally, the third part is dedicated to the modeling of adsorbents, adsorption and
adsorption processes, including the simulation of carbon masks used both for civil and military protection purposes.

This book is addressed to a wide readership. Specialized workers in the field should find the updated materials on several areas of this topic very useful. University teachers could use the material in this book for introductory or graduate courses, and those who have a general interest in the subject should find the offered overviews particularly interesting. There are extensive literature references for further detailed studies.

Many people have contributed to the success of the ARW on which this volume is based. We wish to thank especially the ARW secretary, Ana Mafalda Ribeiro, for her outstanding work, availability and kindness and also Olga Bakalinskaya for her competent assistance in the organization of the meeting. We thank of course all the participants, mainly the invited key speakers, for their contributions to a stimulating intellectual dialogue atmosphere throughout the duration of the Workshop. Finally, it is a great pleasure to acknowledge the financial support provided by the NATO Public Diplomacy Division.

José Miguel Loureiro
Mykola T. Kartel