

Medical Applications of Colloids

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Editor

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 Springer

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ISBN 978-0-387-76920-2 e-ISBN 978-0-387-76921-9
DOI: 10.1007/978-0-387-76921-9

Library of Congress Control Number: 2008924175

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Cover illustration: Follicles of colloid in thyroid

Printed on acid-free paper

9 8 7 6 5 4 3 2 1

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Preface

The important role of finely dispersed matter and surfaces in medicine is not always fully understood and appreciated. Specifically, fine particles (solid or liquid) in the size range of several nanometers to several micrometers have a tremendous effect on our lives, because they can be beneficial or detrimental to our well-being. Such particles are present in living bodies as red blood cells or cholesterol crystals in the gall bladder. They are ubiquitous in the environment, where they can cause many diseases, such as asbestosis, silicosis, and black lung disease, but they are also used in diagnostic tests, drug delivery, and numerous other applications. More recently, evidence has become available that drug formulations with active components in a finely dispersed state may significantly affect their functionality. Furthermore, with miniaturization of medical instrumentation, the size of the components is necessarily reduced to colloid or even smaller range.

This volume is a collection of several chapters dealing with diverse topics of colloids and surfaces relevant to medical applications. Thus, Siiman describes the use of optical properties of uniform colloidal particles as probes in flow cytometry.

Giesche focuses on the preparations and properties of exceedingly uniform silica spheres for different uses, such as in chromatography. In modified forms, silica particles with incorporated dyes are employed in diagnostics and those combined with tiny magnetic entities in drug delivery.

Bosch deals with the role of fine particles in pharmaceutical and therapeutic applications, with special emphasis on the size of the dispersed bioactive materials. The latter can be controlled by mechanical means or by precipitation processes.

Ahmadi and McLaughlin describe biomedical applications of particle transport and deposition. Special attention is given to recent advances in the use of computational models for predicting the transport, dispersion, and deposition of particles in the human airway passages. These include airflow and particle transport in the nose, oral airways, lung bifurcation, and alveolar cavities. In addition, an overview of advances in blood flow simulations in various arteries is presented.

Genet et al. contribute a comprehensive chapter on X-ray photoelectron spectroscopy of biomaterials and biosystems. Thus, valuable information can be obtained on the composition and interfacial phenomena of microorganisms. Other uses

involve detection of the modification of materials to biological exposure, as exemplified by titanium implants in reconstruction and many other cases.

In summary, this volume offers insight into a number of applications of colloid and surface science and techniques of essence in diverse medical applications.

Potsdam, New York, USA

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