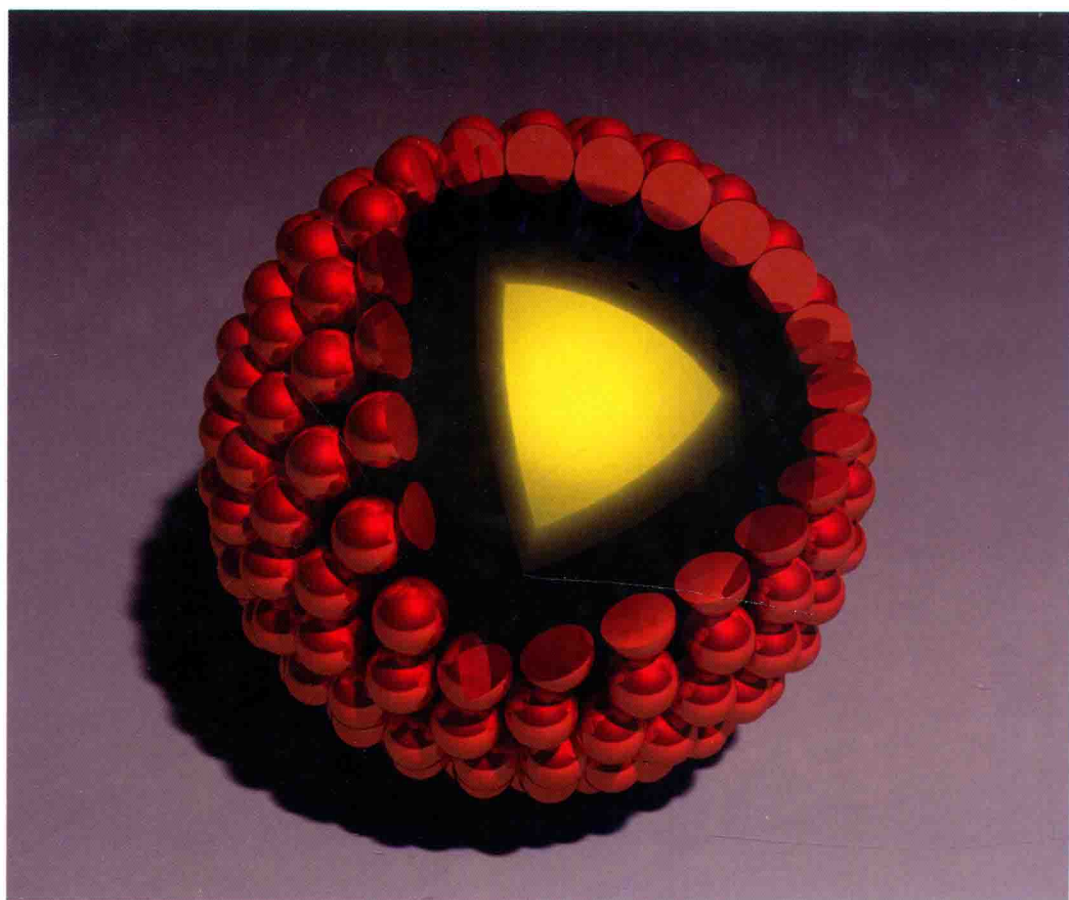


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Colloids and Colloid Assemblies

Synthesis, Modification, Organization
and Utilization of Colloid Particles



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**Synthesis, Modification, Organization
and Utilization of Colloid Particles**

Edited by Frank Caruso



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Foreword

Colloid Science is often described as an “enabling” discipline. The structure, theories, rules, skills or techniques of the colloid scientist allow us to think about what Gibbs called heterogeneous systems, where surface or interfacial energy considerations dominate the properties of such multiphase systems. Equally, the skills of the colloid scientist enable the industrial scientist to resolve challenging physicochemical problems in practice or in the real world. The bioscientist increasingly uses the language of colloid science to understand structure and function in the complex world of biological and medical science.

And then along comes “nanotechnology” to disturb the peaceful world of colloid science! Nanotechnology is at one level, *colloid science with pizzazz*; at another level it is an exciting way of thinking about many new worlds of science and technology.

The present book blends very cleverly the foundations of colloid science within the new perspectives given by the world of nanotechnology. Authors discussing synthesis of particles encompass particles right down to the nanometer scale. Chapters on surface modification are presented as surface engineering to achieve the desired results, again at the nanoscale. There are also significant bio-related chapters where many of the emerging successes in nanotechnology are described.

A great strength of the book is that the authors blend basic, underpinning science with new and emerging discoveries across many fields. It is perhaps the only text available to combine the science of colloids alongside the concepts that drive the assembly of such particles into two- and three-dimensional arrays and organized structures. My belief is that *Colloids and Colloid Assemblies* is an essential resource today and for many years to come to all who want to learn the principles of colloid science in action in the nanoworld.

March 2003

Thomas W. Healy
Melbourne, Australia

Preface

Colloids are ubiquitous, and for centuries they have been of scientific and technological interest. The last decade, however, has seen significant advances made in the preparation of colloids of various sizes (from several nanometers to many micrometers) with diverse and tailored composition. Colloid particles have increasingly found use as building blocks for the creation of nanoassemblies that promise to be the next generation of devices for technology-driven applications. For such “nanodevices” to be realized, it is apparent that state-of-the-art colloids with unique properties are required, and the development of flexible strategies that enable their surface modification, as well as protocols that permit their facile assembly into organized functional structures, are of paramount importance.

The topics in this book cover precisely these key aspects – the book deals with recent global developments in the synthesis, modification, organization, and utilization of colloids in the rapidly emerging fields of nanotechnology and biotechnology. The types of colloids covered include latexes, metal nanoparticles, semiconductor quantum dots, nanocapsules, and miniemulsions. Various methods for the formation of ordered and patterned particle arrays employed in advanced materials preparation are outlined. Several chapters also deal with the use of colloids in niche applications such as biolabeling, biological screening, and drug encapsulation and release. The realm of technological applications of colloids will rapidly expand, thus inspiring research in the area of colloids and colloid assemblies well into this millennium!

The collection of chapters in this book will be of interest to a multidisciplinary audience (chemists, physicists, biologists, engineers, and materials scientists) engaged in active colloid-based research. This book will also arouse the interest of scientists and engineers who wish to diversify their research. Furthermore, it serves as a reference for graduate students and the novice, providing detailed accounts of the current state of research in the various fields.

Finally, I would like to thank all of the contributors for taking valuable time from their busy schedules to write stimulating and informative chapters, and Thomas W. Healy for writing the foreword.

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