

From the Editors

As the size of a solid particle decreases in the order of one millionth of a millimeter, the number of atoms constructing the particle becomes small and in the order of several hundreds or thousands. At this state, the fundamental physical property such as the melting point can change drastically and ceramic materials may be sintered at a lower temperature. Also, as particles get smaller than the wavelength of visible light, they not only become transparent but also emit special light by plasma absorption. They show completely different electromagnetic or physicochemical properties from their bulk counterparts, although they are made of the same materials.

The authors published a book *Nanoparticle Technology* in Japanese in November 2003, which focused on the technology of handling nanoparticles that have unique properties and enormous potential usefulness. This book has drawn great attention from the readers and a growing demand to publish a handbook has developed, which systematically collects the basic information on nanoparticle technology with recent industrial applications.

Nanoparticle Technology to prepare, process, and apply nanoparticles plays a very important role in the development of nanotechnology. It also pays attention to various applications like life sciences, energy, environment, information technology, new materials, etc. However, there has been no handbook or manual on this technology so far. This is the first handbook written in English for handling nanoparticles and surveying their related processing technologies. It has been long awaited by researchers and engineers interested in nanoparticles or their use in the R&D of advanced materials.

This handbook systematically summarizes the fundamentals and state-of-the-art information in various industrial applications related to nanoparticles. However, since the advancement in the fields of concern is so rapid, not only the application developments but also the new physical properties and measuring methods from fundamental research become available as time goes by. Therefore, we plan to revise the contents of the handbook according to new technology developments in the future.

This handbook consists of fundamental and application sections including processing, evaluation, and application in a way different from other similar conventional handbooks. In the fundamental section, the basic properties, structural control of nanoparticles, nanostructural control, and property characterization with the measuring methods in the dispersed particle system are elucidated in detail mainly from the aspects of material processing and property evaluation. At the end of Fundamental Section, a chapter discussing the environmental and safety impact of nanoparticles is also included.

In the Application Section, various nanoparticle applications in the fields of life sciences, environment, energy, information technology, new materials, and production methods are listed according to their future market potential with focus on the new functionalities of nanoparticles.

To publish this handbook, we invited manuscripts from leading researchers and engineers specialized in a broad range of applications of concern as shown in the list of contributors. We would like to thank all the authors who contributed manuscripts despite their busy schedules and our colleagues in Hosokawa overseas operations as well as the staffs of the publisher for their generous supports. We are also deeply indebted to Dr. Y. Tsuji, Managing Director of Hosokawa Powder Technology Foundation and Dr. C. C. Huang of Hosokawa Micron Powder Systems, who gave us many useful comments on the English manuscripts, and to Ms. S. Nakai for her assistance in the preparation of the manuscript and proof.

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