Book Review

Chiu-sen Wang, Inhaled Particles, Elsevier Academic Press, 2005, ISBN-13: 978-0-12-088579-4; ISBN-10: 0-12-088579-4

It was my great pleasure to accept an offer from Aerosol and Air Quality Research to write a book review for the special issue of the journal. I was especially excited because it was a book written by Professor Chiu-sen Wang, a gifted scholar whom I have known for almost 20 years and whose professional life has been closely interwoven with the international aerosol community.

"Inhaled Particles" is a book that deals with aerosol physics, respiratory physiology, health effects, and medicinal applications of aerosols. Having an expertise in aerosol science and public health and being directly involved in the development of these areas of knowledge, the author has a first-hand understanding of the challenges associated with the interaction between inhaled particles and the human respiratory system. Characterizing this interaction is a key to assessing and interpreting the exposure and health risk caused by particulate air pollutants. It is also imperative for the development and validation of methods and techniques involving therapeutic aerosols.

As noted in the preface, intensive studies in recent decades have generated numerous papers and books on the aerosol particle transport in a respiratory tract and health effects associated with aerosol inhalation. However, there was no book that would integrate all the information about inhaled particles in a fashion offered by Professor Wang. The book "Inhaled Particles" demonstrates a crucial importance of lung morphology in quantifying the particle transport and respiratory deposition. Furthermore, in my opinion, it discusses relevant concepts and methods at a level of rigor and depth beyond those found in most available papers and textbooks. In contrast to the books written by other authors, who have individually addressed aerosol exposure assessment, respiratory deposition and clearance, health effects, and aerosol-based diagnostics and treatment, in Professor Wang's presentation all of the above areas are naturally connected and serve as pieces of a meaningful puzzle. Aimed primarily at graduate level students, this two-hundred-page book is an important addition to environmental and occupational hygiene as well as health physics.

The book consists of 12 chapters and covers issues such as

- morphological overview of the human respiratory tract,
- general concepts of the airflow and particle behavior in respiratory system,
- dispersion of inhaled particles,
- inhalability,
- deposition of particles in different regions of the respiratory system,
- particle clearance and accumulation,

- health effects associated with inhaled particles, and
- diagnostics and therapy involving medicinal aerosols.

The Introduction section provides a very good "executive summary" of the book integrating the above-listed issues and introducing basic terminology. Each chapter has its own list of references and concludes with several problems. These are offered to the readers as quizzes as well as an encouragement to better understand the most important aspects described in the chapter and apply them to various contexts. The 6-page Glossary and rather extensive List of Principal Symbols help a great deal comprehend the information; the Appendices provided at the end are also very useful.

Chapters 2 and 3 take a reader for a ride through a human respiratory system describing its morphometry and flow dynamics. This information is of particular value for analyzing the aerosol particle behavior inside the respiratory tract. Chapter 4 communicates the basic principles of aerosol physics that govern the particle motion in airflow. This part represents a snapshot that seems very useful for the beginners in aerosol mechanics. Dispersion (Chapter 5), inhalability (Chapter 6) and respiratory deposition (Chapters 7, 8, and 9) of inhaled particles are described in detail and address various factors that may affect the health outcome. While the respiratory deposition has been studied extensively over several decades, mechanisms of particle clearance and accumulation have received less attention with respect to their quantitative characterization. Chapter 10 provides good insight to this issue. I found the last two chapters – Chapter 11 on health effects and Chapter 12 on the aerosol-based applications – very interesting and appropriate as the final part of the monograph.

This book does a great job of gathering and synthesizing information on a very broad range of issues. If there are shortcomings, they stem neither from its scientific content, which is superb, nor from its design and structure. Access to the wealth of material presented in this book, requires, in my opinion, a far more comprehensive index than provided. In some chapters, the references are not completely up-to-date (e.g., several papers on the inhalable aerosol convention published in the 2000s are missing in Chapter 6; similarly, it seems worth mentioning in Chapter 9 the latest modifications of the ICRP model targeting different age groups). In addition, more illustrations would have been useful to communicate the theoretical and experimental data on respiratory deposition. However, my overriding conclusion is that "Inhaled Particles" is an excellent book to read for both an accomplished scientist and someone who has just started understanding this exciting research field.

It took the author ten years to prepare this book. Originated from the graduate course class notes, it was written in three stages (with some interruptions) and completed in 2004. The final stage benefited from the author's interaction with Sheldon Friedlander, Morton Lippmann and James Vincent, who offered their suggestions, encouragement, and support for the book.

The publication of "Inhaled Particles" in the Elsevier's series *Interface Science and Technology* is a wonderful present that Chiu-sen Wang created right before his 70th birthday for many experts as well as newcomers who will find ample food for thought in this great piece of work.

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