

BOOK REVIEWS

Particle Control for Semiconductor Manufacturing

Reviewed by J. D. Sinclair, Head of Materials Reliability and Electrochemistry Department, AT&T Bell Laboratories, Murray Hill, NJ 07974.

REFERENCE: Donovan, R. P., Ed., *Particle Control for Semiconductor Manufacturing*, Marcel Dekker, Inc., New York, 1990. ISBN 0-8247-8242-9.

This book consists of updated notes for a short course on "Particle Control in Semiconductor Manufacturing" organized by researchers at the Research Triangle Institute. Fourteen authors from ten institutions contributed to the 26 chapters in this book. The book is primarily intended to provide newcomers to the problem of particle control in manufacturing with the fundamental understanding and practical information needed to deal with the everyday issues they will face. Much of the information will also be useful to experienced practitioners as a checklist of important considerations in particle control. Many of the concepts and control strategies described in the book are not limited in their usefulness to semiconductor processing. The book is relevant to all types of manufacturing that must be particle free.

The book begins with a discussion on particle interactions with integrated circuits to demonstrate the importance of employing advanced particle control in manufacturing. The next several chapters deal with the fundamental aspects of particle behavior, particle size distribution, light scattering theory, and particle counters for ultra-fine, fine, and coarse particles. These chapters are followed by ten chapters covering the subjects of particle filtration, modeling of cleanroom performance, cleanroom evaluations and certification, particle measurement and control in processes and process fluids, and cleanroom garments. The next several chapters deal with equipment design for particle control and consider such topics as adhesion and cleaning of particles on wafers and on the surfaces of processing equipment, and air ionization. The book closes with a review of circuit defect analysis and the federal standard on cleanroom classification.

Because this book is a compilation of course notes, the reader should not expect to find a consistent style or even quality of presentation. Some chapters follow a logical progression of concepts, other are anecdotal, and some are written in a how-to-do-it, what-to-export style. Most chapters communicate difficult concepts very effectively. A few are clear and efficiently presented but overly simplistic or lack polish, that is, they read like course notes. The novice may need to consult references to understand some of the more difficult concepts in a couple of the chapters. A few chapters are weak on useful information, at

least from this reviewer's perspective, but these will not detract from the overall value of the book in providing a sound road map for how to approach particle control through process understanding. The reader will find an appreciable amount of overlap that the newcomer will probably find helpful. The reader will also probably want to ignore the commercial information in a couple of chapters.

If an individual can be found with sufficient knowledge of all the information provided in this compilation of course notes to write a textbook, the result will be a more cohesive and concise product. Until then, cleanroom practitioners are well-served by this book.

Corrosion Resistance Tables: Parts A and B

Reviewed by Victor Chaker, Engineer of Research Corrosion Control Engineering, Port Authority of NY-NJ, One World Trade Center, 72S, New York, NY 10048.

REFERENCE: Schweitzer, P. A., Ed., *Corrosion Resistance Tables: Parts A and B*, 3rd ed., Marcel Dekker, Inc., New York, 1991, ISBN 0-8247-8372-7 (Vol. 1) and 0-8247-8373-5 (Vol. 2), \$250.00 (U.S. and Canada), \$287.50 (all other countries).

The two part book is faithful to its title *Corrosion Resistance Tables*. It is a compilation of very valuable corrosion data in table after table. The data are uniquely tabulated in sequence for each corrodent and its interaction with metals, coatings, mortars, plastics, elastomers and linings, and fabrics.

Corrosion of metals impacts every living being. Thus the knowledge of materials and its interaction with each other must be of interest to every educated person. The book is a practical reference to a large variety of individuals. The chemical engineer can use it to select suitable material for construction and containment of many corrodents. The corrosion engineer can use it to estimate the corrosion rate of selected materials in various environments.

One of the methods of controlling corrosion is material selection. This book will help guide any person faced with the task of material selection and for keeping corrosion under control.

The large body of information contained in the tables was gathered from many sources, a difficult task. However, a listing of the sources as reference did not appear anywhere in the book.

The introduction of the book cautions the reader or user, correctly, that the tables "should only be used as a guide since it is extremely difficult, and at times impossible to duplicate actual operating conditions."

BOOK REVIEWS

The Engineering Standard, A Most Useful Tool

Reviewed by Thomas M. Jenkins, Principal, Assets Management Services, Fair Hill, MD 21921-2442.

REFERENCE: Batik, A. L., *The Engineering Standard, A Most Useful Tool*, Bookmaster/EI Rancho, Ashland, OH 1992.

Standards have evolved to enable us to handle complexity reliably. In practice, they are often misused, abused or ignored—with predictable consequences. The fundamental purpose of this book, contained in its title, is to broadcast the message that standards are a tool to assure that products and services meet the needs of those who use them. As the rest of the world, using standards as tools for continuous improvement, develops capabilities that match or exceed those the U.S. formerly monopolized, many U.S. enterprises will be forced to attend to the basics of standards.

The author treats the subject of standards in a comprehensive way from various perspectives. Not only does he describe how standards can be used effectively in all aspects of enterprise, from design through purchasing, manufacturing and marketing, he identifies how standards and standards processes have historically been misused and abused.

It may be anticipated that some will be offended by descriptions of the less savory aspects of standards development and use. In this reviewer's opinion, this aspect of the book is necessary to effectively instruct those who have leadership responsibility yet lack familiarity with the purpose, processes and functions of standards and standards-crafting organizations.

Those who value editorial standards in publishing will find their patience tested by the presentation of this book. The number of spelling errors, particularly in the early chapters of the book, is distressing. The lack of section headings within chapters makes it difficult to quickly sense the thrust of a chapter. This said, there is a comprehensive listing of sources of standards. The index is solidly functional and the bibliography is comprehensive. Material quoted from other sources is acknowledged and listed.

The Engineering Standard, A Most Useful Tool, should be of significant utility to functional managers in both service and production industries regardless of the size of the enterprise. Quality improvement teams, trainers and facilitators as well as engineering, quality and manufacturing educators would be well-advised to master the material in this book. Purchasing managers, attorneys, and consumer advocates will find much of value in selected chapters that review legal, ethical, purchasing and management issues.

The processes that standards-crafting organizations use and the means of participating in these processes are thoroughly described. The description of the role of standards in quality management is very tightly reasoned and presented.

Overall, the book is an outstanding contribution to a broader and richer understanding of the various uses of standards in a competitive world economy. Because the ability of nations to compete in the world economy hinges more and more strongly on the ability to perform using dispersed production and service systems, the lessons presented in this book will become more and more critical to learn and extend.