Introduction to Semiconductor Manufacturing Technology

Hong Xiao
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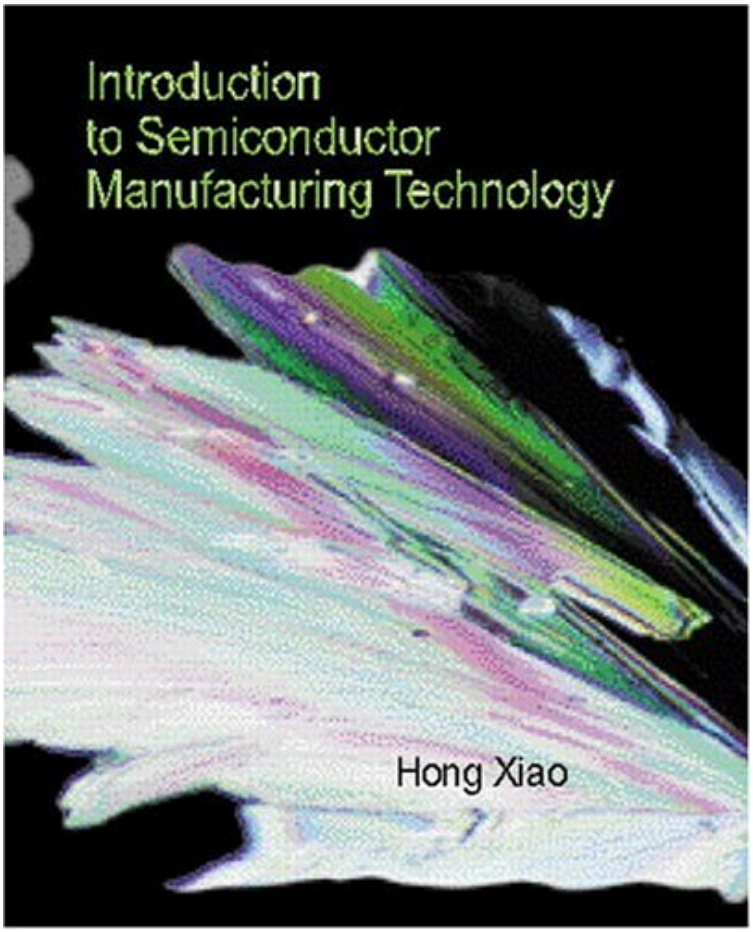

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Hong Xiao : Introduction to Semiconductor Manufacturing Technology before purchasing it in order to gage whether or not it would be worth my time, and all praised Introduction to Semiconductor Manufacturing Technology:

0 of 0 people found the following review helpful. Good and very useful bookBy RamThis book helps a lot if someone wants to learn basics of semiconductor processing. Very simple to understand and You can read it like a Novel.However, the book avoids mathematical equations while discussing major concepts, and without them it will be difficult for anyone to comprehend the relation between any two or more parameters.4 of 4 people found the following review helpful. A job-saver!!!By Stephanie BryantI started a job as a technical writer at a semiconductor company in April, 2002. A couple weeks later, I bought this book because I didn't totally understand what the industry was all about. It has really taught me everything I needed to know about the semiconductor industry, and the role my company's products play in it.The reason I give it 4 stars is because at one (early) point the book says "this is the hardest math in this book," which just isn't true. However, anyone who passed high school algebra 2 will be able to do the rest of the math in the book, or you can skip it if you're not looking for a math/science lesson.If you are learning

about semiconductors for a job, or you are starting an academic program in semiconductor engineering, this is a terrific book. I don't know if experienced engineers will find it useful, as I'm not an experienced engineer. Every new tech writer to come into the company has also borrowed this book during the first couple of weeks, just to help them get into the swing of things.0 of 0 people found the following review helpful. A good introductory bookBy focusdeepwarm01This is a good entry-level book written in an easy tone, the author is currently giving lecture in China.The whole book uses less than ten equations, however, this is the point that anyone with any background can read through this book without difficulties.

For courses in Semiconductor Manufacturing Technology, IC Fabrication Technology, and Devices: Conventional Flow.This up-to-date text on semiconductor manufacturing processes takes into consideration the rapid development of the industry's technology. It thoroughly describes the complicated and new IC chip fabrication processes in detail--with minimum mathematics, physics, and chemistry. Advanced technologies are covered along with older ones to assist students in understanding the development processes from a historic point of view.

From the Inside FlapPREFACE The semiconductor industry is developing rapidly with new technology introduced almost on a daily basis. The device feature size is shrinking continuously and the number of transistors on an integrated circuit (IC) chip is increasing rapidly, as predicted by Moore's law. Compared with only a decade ago, IC fabrication processing technology has become more complicated. This book thoroughly describes the complicated IC chip manufacturing processes in a semiconductor fab, using minimum mathematics, chemistry, and physics. It covers the advanced technologies while keeping the contents simple and easy to understand for readers without science and engineering degrees. It focuses on the newest IC fabrication technologies and describes the older technologies to provide better understanding of the historical development. The processes chosen for the book are very close to those in real fabs, especially on process troubleshooting and process and hardware relations. This book is intended for technical and college students who need an in-depth understanding of the technology as they prepare to find a job in the field. It is also intended as a reference book for engineering students and to provide a more realistic picture of the semiconductor industry. Industry operators, technicians, engineers, and personnel in sales, marketing, administration, and management can also benefit. This book can help them to learn more about their jobs, improve their troubleshooting and problem-solving skills, and raise their career development potential. Chapter 1 briefly reviews the history of the semiconductor industry and describes semiconductor manufacturing processes. Chapter 2 introduces basic semiconductor fabrication including yield, cleanroom, semiconductor fab, and IC chip test and packaging. Chapter 3 gives a brief review of fabrication semiconductor devices, IC chips, and early technologies in semiconductor processing. Crystal structure, singles, crystal silicon wafer manufacturing, and epitaxial silicon growth are described in Chapter 4. Chapter 5 lists and discusses thermal processes, including oxidation, diffusion, annealing, alloying, and reflow processes. Rapid thermal processes (RTP) and conventional furnace thermal processes are discussed. Chapter 6 details the photolithography process. Fundamentals of plasmas used in semiconductor processing are covered in Chapter 7; it introduces plasma applications, DC bias, and plasma-process relations. Chapter 8 discusses the ion implantation process. Chapter 9 gives a detailed description of etch processes including wet and dry etches; chemical, reactive ion etch (RIE), and physical etches; and patterned and blanket etch processes. Basic chemical vapor deposition (CVD) and dielectric thin-film deposition processes, including dielectric CVD processes, process trends, troubleshooting, and future trends are discussed in detail in Chapter 10. Chapter 11 covers metallization, metal CVD, and physical vapor deposition (PVD) processes. It also describes the copper metallization process. Planarization processes including chemical mechanical polishing (CMP) are discussed in Chapter 12. Chapter 13 discusses process integration. Chapter 14 diagrams CMOS process flows including an advanced CMOS process flow with copper and low-k interconnection. Chapter 15 predicts the future development of the semiconductor industry. Many people helped me to write this book. I especially appreciate the useful information provided by my current and former colleagues: Lou Frenzel, Thomas E. Thompson, Ole Krogh, Tony Shi, Alberto Quinonez, Lance Kinney, Scott Bolton, and Steve Reedy. Many of my students helped me by proofreading end improving the book. I especially express my thanks to Wayne Parent, Jeffrey Carroll, Boyd Woods, and Ronald Tabery. I would also like to thank the following reviewers for their valuable suggestions: Professor Dave Hata, Portland Community College; Professor Fred Lavender, Albuquerque Technical Institute; Professor Gene Stouder, Southwest Texas State University; Professor Bassam Matar, Glendale Community College; Professor Carlo Sapijaszko, DeVry Institute of Technology; Professor George Shaiffer, Pikes Peak Community College; Professor Val Shires, Gwinnett Technical Institute; and Professor Devinder Sud, DeVry Institute.Hong XiaoFrom the Back CoverThis book is written for technology students taking their first course in semiconductor manufacturing. It contains comprehensive and up-to-date information on this fast-changing industry. The text provides excellent descriptions of semiconductors, advanced manufacturing technologies, and plasma in integrated circuit (IC) processes. It focuses on the newest IC fabrication technologies and also describes older technologies to help the reader understand the development from an historical perspective. The material covered in the text is very close to real fabrication situations.Excerpt. Reprinted by permission. PREFACE The

semiconductor industry is developing rapidly with new technology introduced almost on a daily basis. The device feature size is shrinking continuously and the number of transistors on an integrated circuit (IC) chip is increasing rapidly, as predicted by Moore's law. Compared with only a decade ago, IC fabrication processing technology has become more complicated. This book thoroughly describes the complicated IC chip manufacturing processes in a semiconductor fab, using minimum mathematics, chemistry, and physics. It covers the advanced technologies while keeping the contents simple and easy to understand for readers without science and engineering degrees. It focuses on the newest IC fabrication technologies and describes the older technologies to provide better understanding of the historical development. The processes chosen for the book are very close to those in real fabs, especially on process troubleshooting and process and hardware relations. This book is intended for technical and college students who need an in-depth understanding of the technology as they prepare to find a job in the field. It is also intended as a reference book for engineering students and to provide a more realistic picture of the semiconductor industry. Industry operators, technicians, engineers, and personnel in sales, marketing, administration, and management can also benefit. This book can help them to learn more about their jobs, improve their troubleshooting and problem-solving skills, and raise their career development potential. Chapter 1 briefly reviews the history of the semiconductor industry and describes semiconductor manufacturing processes. Chapter 2 introduces basic semiconductor fabrication including yield, cleanroom, semiconductor fab, and IC chip test and packaging. Chapter 3 gives a brief review of fabrication semiconductor devices, IC chips, and early technologies in semiconductor processing. Crystal structure, singles, crystal silicon wafer manufacturing, and epitaxial silicon growth are described in Chapter 4. Chapter 5 lists and discusses thermal processes, including oxidation, diffusion, annealing, alloying, and reflow processes. Rapid thermal processes (RTP) and conventional furnace thermal processes are discussed. Chapter 6 details the photolithography process. Fundamentals of plasmas used in semiconductor processing are covered in Chapter 7; it introduces plasma applications, DC bias, and plasma-process relations. Chapter 8 discusses the ion implantation process. Chapter 9 gives a detailed description of etch processes including wet and dry etches; chemical, reactive ion etch (RIE), and physical etches; and patterned and blanket etch processes. Basic chemical vapor deposition (CVD) and dielectric thin-film deposition processes, including dielectric CVD processes, process trends, troubleshooting, and future trends are discussed in detail in Chapter 10. Chapter 11 covers metallization, metal CVD, and physical vapor deposition (PVD) processes. It also describes the copper metallization process. Planarization processes including chemical mechanical polishing (CMP) are discussed in Chapter 12. Chapter 13 discusses process integration. Chapter 14 diagrams CMOS process flows including an advanced CMOS process flow with copper and low-k interconnection. Chapter 15 predicts the future development of the semiconductor industry. Many people helped me to write this book. I especially appreciate the useful information provided by my current and former colleagues: Lou Frenzel, Thomas E. Thompson, Ole Krogh, Tony Shi, Alberto Quinonez, Lance Kinney, Scott Bolton, and Steve Reedy. Many of my students helped me by proofreading end improving the book. I especially express my thanks to Wayne Parent, Jeffrey Carroll, Boyd Woods, and Ronald Tabery. I would also like to thank the following reviewers for their valuable suggestions: Professor Dave Hata, Portland Community College; Professor Fred Lavender, Albuquerque Technical Institute; Professor Gene Stouder, Southwest Texas State University; Professor Bassam Matar, Glendale Community College; Professor Carlo Sapijaszko, DeVry Institute of Technology; Professor George Shaiffer, Pikes Peak Community College; Professor Val Shires, Gwinnett Technical Institute; and Professor Devinder Sud, DeVry Institute. Hong Xiao