



# Spectroscopic Ellipsometry: Principles and Applications

By Hiroyuki Fujiwara

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Ellipsometry is a powerful tool used for the characterization of thin films and multi-layer semiconductor structures. This book deals with fundamental principles and applications of spectroscopic ellipsometry (SE). Beginning with an overview of SE technologies the text moves on to focus on the data analysis of results obtained from SE. Fundamental data analyses, principles and physical backgrounds and the various materials used in different fields from LSI industry to biotechnology are described. The final chapter describes the latest developments of real-time monitoring and process control which have attracted significant attention in various scientific and industrial fields.

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## **Spectroscopic Ellipsometry: Principles and Applications By Hiroyuki Fujiwara Bibliography**

- Sales Rank: #1961962 in Books
- Published on: 2007-03-12
- Original language: English
- Number of items: 1
- Dimensions: 9.25" h x 1.05" w x 6.28" l, 1.50 pounds
- Binding: Hardcover
- 392 pages



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### Editorial Review

#### From the Back Cover

Spectroscopic ellipsometry has established its position as a high-precision optical-characterization technique — nevertheless, the principles of ellipsometry are often said to be difficult, partly due to the lack of proper knowledge for polarized light used as a probe in ellipsometry. The objective of this book is to provide a fundamental understanding of spectroscopic ellipsometry particularly for researchers who are not familiar with the ellipsometry technique. Although some aspects of the technique are complicated, the understanding is not essentially difficult, if one comprehends the principles in order. Based on this point of view, this highly-illustrated book provides general descriptions for measurement and data analysis methods employed widely in spectroscopic ellipsometry.

In order to comprehend spectroscopic ellipsometry, however, a fundamental knowledge for optics is required. In the book, therefore, "Principles of Optics" and "Polarization of Light" are described (Chapters 2 and 3). From these two chapters, the principles of spectroscopic ellipsometry presented in Chapter 4 can be understood more easily. The author focuses on data analysis in the next few chapters: in particular, the principles and physical backgrounds of ellipsometry analysis are discussed in detail in Chapter 5. Since there is growing interest for optical anisotropy, the data analysis of anisotropic materials is explained in Chapters 6 and the subsequent chapter presents examples of ellipsometry analyses for various materials used in different fields are described. In the final chapter, the applications of spectroscopic ellipsometry for growth monitoring and feedback control of processing are addressed.

This book will be appropriate as a text for students as well as researchers, in institutes and industrial laboratories, in providing practical information on the applications of spectroscopic ellipsometry.

#### About the Author

**Dr Hiroyuki Fujiwara** is based at the National Institute of Advanced Industrial Science and Technology, Ibaraki, Japan. He received his PhD at the Tokyo Institute of Technology in 1996 and carried out post-doctoral research with Professor R.W. Collins at Penn State University. From 1998 to present he has been working as a senior research scientist at the Research Center for Photovoltaics at NIAIST. He received the 'Most Promising Young Scientist Award' from the Japan Society of Applied Physics and the 'Young Researcher Award' at the World Conference on Photovoltaic Energy Conversion in 2003.

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