REFLECTION HIGH-ENERGY ELECTRON DIFFRACTION

Reflection high-energy electron diffraction (RHEED) is the analytical tool of choice for characterizing thin films during growth by molecular beam epitaxy, since it is very sensitive to surface structure and morphology. However, there has been a need for a book which explains how to analyze RHEED patterns.

This book serves as an introduction to RHEED for beginners and describes detailed experimental and theoretical treatments for experts. First the principles of electron diffraction and many examples of the interpretation of RHEED patterns are described for beginners. The second part contains detailed descriptions of RHEED theory. The third part applies RHEED to the determination of surface structures, gives detailed descriptions of the effects of disorder and critically reviews the mechanisms contributing to RHEED intensity oscillations.

This unified and coherent account will appeal to both graduate students and researchers in the study of molecular beam epitaxial growth.

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To our families, especially our wives, Aoi and Mary.

Contents

Preface

Reflection high-energy electron diffraction (RHEED) is widely used for surface structural analysis in monitoring epitaxial growth. The purposes of this book are to serve as an introduction to RHEED for beginners and to describe detailed experimental and theoretical treatments for experts. This book consists of three parts. From Chapter 1 to Chapter 8 the principles of electron diffraction and many examples of RHEED patterns are described for beginners. Chapters 9–14 and Chapter 16 give detailed descriptions of RHEED theory. The third part consists of applications of RHEED. In Chapter 15, methods for the determination of atomic structures of surfaces using RHEED are explained with some examples. Chapters 17 and 18 give detailed descriptions of RHEED in the study of surface disordering and epitaxial growth. In Chapter 19 we describe RHEED intensity oscillations for various growth systems.

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