1. Record Nr. UNINA9910830321103321 Autore Quinten Michael Titolo A practical guide to optical metrology for thin films [[electronic resource] /] / Michael Quinten Weinheim,: Wiley-VCH, c2013 Pubbl/distr/stampa **ISBN** 1-299-47599-X 3-527-66437-8 3-527-66434-3 3-527-66435-1 Descrizione fisica 1 online resource (225 p.) Disciplina 530.42750287 Soggetti Thin films - Optical properties Thin films - Measurement Optical measurements Lingua di pubblicazione Inglese **Formato** Materiale a stampa Livello bibliografico Monografia Note generali Description based upon print version of record. Includes bibliographical references (p. 201-208) and index. Nota di bibliografia Nota di contenuto A Practical Guide to Optical Metrology for Thin Films; Contents; Preface; 1 Introduction: 2 Propagation of Light and Other Electromagnetic Waves; 2.1 Properties of Electromagnetic Waves; 2.2 Huygens-Fresnel Principle; 2.3 Interference of Electromagnetic Waves; 2.4 Reflection and Refraction; 2.5 Diffraction; 2.5.1 Transmission Gratings; 2.5.1.1 Lamellar Transmission Gratings; 2.5.1.2 Holographic Transmission Gratings; 2.5.2 Reflection Gratings; 2.5.2.1 Lamellar Reflection Gratings; 2.5.2.2 Blazed Gratings; 2.5.2.3 Holographic Gratings; 2.6 Scattering 2.7 Dielectric Function and Refractive Index2.7.1 Models for the Dielectric Function; 2.7.2 Kramers-Kronig Analysis of Dielectric Functions; 2.7.3 Empiric Formulas for the Refractive Index; 2.7.4 EMA Models: 3 Spectral Reflectance and Transmittance of a Laver Stack: 3.1 Reflectance and Transmittance of a Single Layer; 3.1.1 Coherent Superposition of Reflected Light; 3.1.2 Influence of Absorption on the Layer; 3.1.3 Partial Incoherence due to Thick Substrates; 3.1.4 Partial

Incoherence due to Roughness; 3.1.5 Coherent Superposition of

Transmitted Light

3.2 Propagating Wave Model for a Layer Stack3.2.1 Coherent Reflectance and Transmittance of a Layer Stack; 3.2.2 Consideration of Incoherent Substrates; 3.2.3 Consideration of Surface Roughness; 3.2.4 r-t-ø Model for a Layer Stack; 4 The Optical Measurement; 4.1 Spectral Reflectance and Transmittance Measurement; 4.2 Ellipsometric Measurement; 4.3 Other Optical Methods; 4.3.1 Prism Coupling; 4.3.2 Chromatic Thickness Determination; 4.4 Components for the Optical Measurement; 4.4.1 Light Sources; 4.4.1.1 Halogen Lamps; 4.4.1.2 White Light LED: 4.4.1.3 Superluminescence Diodes 4.4.1.4 Xenon High-Pressure Arc Lamps4.4.1.5 Deuterium Lamps; 4.4.2 Optical Components; 4.4.2.1 Lenses and Mirrors; 4.4.2.2 Polarizers and Analyzers; 4.4.2.3 Optical Retarders; 4.4.3 Optical Fibers; 4.4.4 Miniaturized Spectrometers; 4.4.4.1 Gratings; 4.4.4.2 Detectors; 4.4.4.3 System Properties; 5 Thin-Film Thickness Determination: 5.1 Fast Fourier Transform: 5.1.1 Single Layer: 5.1.2 Layer Stack; 5.1.3 Accuracy, Resolution, Repeatability, and Reproducibility; 5.2 Regression Analysis with 2-Test; 5.2.1 Method of Thickness Determination 5.2.2 Accuracy, Resolution, Repeatability, and Reproducibility6 The Color of Thin Films; 7 Applications; 7.1 High-Reflection and Antireflection Coatings: 7.1.1 HR Coatings on Metallic Mirrors; 7.1.2 AR Coatings on Glass; 7.1.3 AR Coatings on Solar Wafers; 7.2 Thin Singleand Double-Layer Coatings; 7.2.1 SiO2 on Silicon Wafers; 7.2.2 Si3N4 Hardcoat; 7.2.3 Double-Layer System; 7.2.4 Porous Silicon on Silicon; 7.3 Photoresists and Photolithographic Structuring; 7.4 Thickness of Wafers and Transparent Plastic Films; 7.4.1 Thickness of Semiconductor, Glass, and Sapphire Wafers 7.4.2 Thickness of Transparent Plastic Films

Sommario/riassunto

A one-stop, concise guide on determining and measuring thin film thickness by optical methods. This practical book covers the laws of electromagnetic radiation and interaction of light with matter, as well as the theory and practice of thickness measurement, and modern applications. In so doing, it shows the capabilities and opportunities of optical thickness determination and discusses the strengths and weaknesses of measurement devices along with their evaluation methods. Following an introduction to the topic, Chapter 2 presents the basics of the propagation of light a