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3.5.1 Linearly Polarized Electromagnetic Plane Waves3.5.2 Circularly Polarized Electromagnetic Plane Waves; 3.5.3 Elliptically Polarized Electromagnetic Plane Waves; 3.6 Electromagnetic Energy; 3.6.1 Energy Density and Energy Flux for Electromagnetic Plane Waves; 3.6.2 Time-averaged Values; 3.6.3 Intensity; 3.7 Interference of Electromagnetic Plane Waves; 3.7.1 Three-dimensional Interference Patterns; 3.8 Interference Lithography; 3.8.1 Photoresist Materials; 3.8.2 The Interference Lithography Technique; 3.8.3 Designing Periodic Structures; Further Reading; Problems
4 Periodic Structures and Interference Lithography4.1 The Connection between the Interference of Plane Waves and Fourier Series; 4.2 Simple Periodic Structures in Two Dimensions Via Interference Lithography; 4.3 Simple Periodic Structures in Three Dimensions Via Interference Lithography; Further Reading; Problems; Experimental; 5 Fabrication of Periodic Structures; 5.1 Introduction; 5.2 Light Beams; 5.3 Multiple Gratings and the Registration Challenge; 5.4 Beam Configuration; 5.4.1 Using Four Beams; 5.4.2 Using a Single Beam (Phase Mask Lithography) 5.5 Pattern Transfer: Material Platforms and Photoresists5.5.1 Negative Photoresists; 5.5.2 Positive Photoresists; 5.5.3 Organic-Inorganic Hybrids Resists; 5.6 Practical Considerations for Interference Lithography; 5.6.1 Preserving Polarizations and Directions; 5.6.2 Contrast; 5.6.3 Drying; 5.6.4 Shrinkage; 5.6.5 Backfilling - Creating Inverse Periodic Structures; 5.6.6 Volume Fraction Control; 5.7 Closing Remarks; Further Reading; Applications; 6 Photonic Crystals; 6.1 Introduction; 6.2 One-dimensional Photonic Crystals; 6.2.1 Finite Periodic Structures; 6.2.2 Infinite Periodic Structures
6.2.3 Finite versus Infinite Periodic Structures

Sommario/riassunto

Written by the department head of materials science and engineering at MIT, this concise and stringent introduction takes readers from the fundamental theory to in-depth knowledge.It sets out with a theoretical scheme for the design of desirable periodic structures, then presents the experimental techniques that allow for fabrication of the periodic structure and exemplary experimental data. Subsequently, theory and numerical data are used to demonstrate how these periodic structures control the photonic, acoustic, and mechanical properties of materials, concluding with examples from these