Introduction to Focused Ion Beams: Instrumentation, Theory, Techniques and Practice

Lucille A. Giannuzzi and Fred A. Stevie, eds. Springer, 2005; $79.95 (hardcover).

The focused ion beam (FIB) instrument, originally invented for sample preparation within the semiconductor industry, is being developed continuously for material characterization and nanotechnology. In recent years, FIB and dual platform instrumentation have been widely used in metallurgy, ceramics, composites, polymers, geology, art, biology, pharmaceuticals, forensics and other fields.

This book goes beyond the fundamentals of FIB instrumentation, milling and deposition to focus on the theory of ion-solid interactions and specific techniques on FIB applications. The authors are leading FIB researchers with abundant practical experiences. This is an excellent reference for engineers and students working on FIB and related tools.

[Review by Jizhong Chen, electron optics design engineer, GE Healthcare.]

Solid-State Mid-Infrared Laser Sources


This brilliant book in the famous Springer series *Topics in Applied Physics* summarizes the state-of-the-art research on the conceptually and technologically critical topic of laser sources emitting in the broader middle infrared electromagnetic band (2-30 µm) and consisting of appropriately exploited solid state optoelectronic devices.

The volume, comprising 12 autonomous sections contributed by well-selected groups of authors, has been edited by two pioneering researchers—Konstantin L. Vodopyanov of Ginzton Laboratory at Stanford University and Irina T. Sorokina of the Photonics Institute at the Technical University of Vienna—who have made significant contributions in the areas of pulsed mid-infrared optical parametric oscillators and crystalline mid-infrared lasers, respectively.

This subject is a hot one in view of its applicability to a vast range of techniques, characterizations and processes, such as molecular fingerprint spectroscopy, remote light detection and ranging (LIDAR) of many pollutant trace gases and vapors, tunable mid-IR laser microsurgery and non-invasive medical diagnostics, ultrasensitive security detection and free-space robust and reliable communication.

The book compiles harmoniously the research outcomes and breakthroughs achieved by scientific communities related to semiconductor physics, solid state and materials science, nonlinear and quantum optics and laser technology focusing on the potential of creating, operating and applying cost-effective, solid-state, mid-infrared laser sources.

Apart from the two sections by the editors, the volume treats heterojunction 2-5 µm laser diodes, IR difference frequency generation with spectroscopic applications, mid-IR fiber lasers, Raman lasers based on a variety of crystals and optical fibers, THz coherent sources based on both nonlinear optical methodology and intersubband transitions within quantum wells of semiconductor heterostructures, spectroscopic exploitation of mid-IR lasers for sensitive and selective trace gas detection, and—at last but not least—frontier medical applications in microsurgery, dermatology and angioplasty.

I suggest that the monograph become a functional element in the library of every university and research foundation concerned with nanoscale science and technology, optoelectronics, laser principles and applications and contemporary aspects of applied solid-state physics.

[Review by Emmanuel A. Anagnostakis, coordinator of the Nanodevice Physics Forum in Athens, Greece.]

The opinions expressed in the book review section are those of the reviewer and do not necessarily reflect those of OPN or OSA.
Extreme Nonlinear Optics
Martin Wegener
Springer, 2005; $79.95 (hardcover).

This eight-chapter book was written by an experimental physicist who recognized that the distinctions between traditional nonlinear optics and extreme nonlinear optics are, in many cases, significant and worthy of discussion.

The specialized cross-disciplinary field of extreme nonlinear optics is of interest to physicists, electrical engineers and the optics communities, especially at the advanced end of the spectrum. Advanced undergraduate students in these areas could also benefit from this book, although they may need to make an extra effort to understand it.

The first chapter makes the case for why extreme nonlinear optics deserves its own book. The primary reason is to document the progress that researchers have made in generating the ultra-strong laser fields needed to create the conditions for extreme nonlinear optics. And of course, leading labs will generate even more intense laser fields in the not-too-distant future.

The first six chapters contain the basic effects and theories of extreme nonlinear optics, and the final two detail these effects at the solid state and atomic levels. The book contains 86 figures and many examples, which are very helpful. I especially like the solutions section at the end of the book, which explains in detail the answers to the practical problems that are given in almost every chapter. The book could certainly serve as a textbook for a course. I’m happy that I have it in my library and would recommend it for yours.

[Review by David Finsmith, IBM Corporation.]

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