NANOTECHNOLOGY

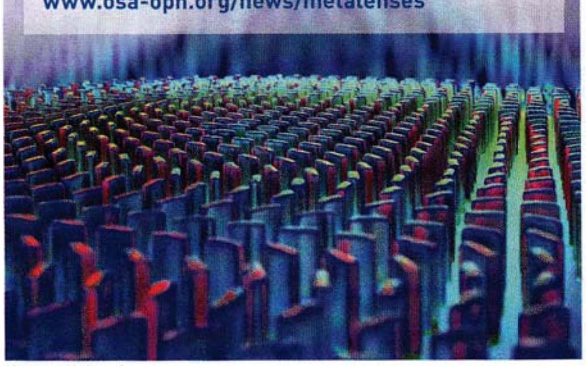
A Broader View for Metalenses

Researchers at Harvard University, USA, led by OSA Fellow Federico Capasso, have designed a flat, achromatic metalens that can focus light while correcting for chromatic aberration across a sizable chunk of the visible spectrum (Nano Lett., doi: 10.1021/acs.nanolett.6b05137). The bandwidth covered by the lens is "close to that of an LED." The ability to engineer dispersion control across that bandwidth, in an ultraflat lens, could open new applications in imaging, spectroscopy and sensing.

The team began with some detailed numerical modeling of the TiO_2 nanopillars used as the main building block in the metalenses. They tweaked the model parameters, including the nanopillars' cross-sectional shape, width, center-to-center distance, and height, to maximize the phase coverage of the surface—and to allow guided-mode resonances for dispersion control at visible wavelengths. The team then fed the parameters into their fab process to create a prototype metalens.

The result was a flat, achromatic lens with numerical aperture of 0.2, which could focus light continuously across a range of wavelengths from 490 nm to 550 nm without chromatic dispersion. The team also created a second metalens that featured *reverse* chromatic dispersion. —*Stewart Wills*

www.osa-opn.org/news/metalenses

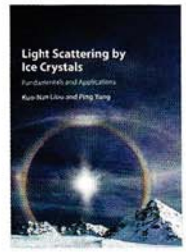


Harvard University

BOOK REVIEWS

Light Scattering by Ice Crystals

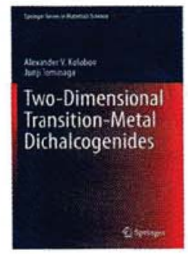
K. Liou and P. Yang, Cambridge Univ. Press, 2016



The book is directed at researchers and graduate students in the atmospheric sciences; this audience will be well served by this masterly exposition. Those with less specialized interests could also benefit. A substantial reference list enables acquisition of the relevant primary material. There are excellent diagrams. Detailed attention is given to applications in remote sensing and climate studies, where the interplay between theory and experiment is strongly apparent. —*K. Alan Shore*

Two-Dimensional Transition-Metal Dichalcogenides

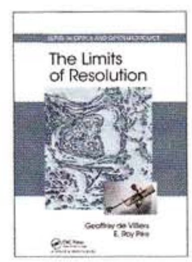
A.V Kolobov and J. Tominaga, Springer, 2016



The book begins with a deep introduction to the physics of 3-D and 2-D transition-metal dichalcogenides (TMDs). Optical properties of TMDs constitute the core of the book, in which Raman scattering and luminescence are extensively described. The closing chapters are dedicated to the applications of 2D-TMDs and their heterostructures. The book has beautiful color illustrations and tens of references at the end of each chapter. It is a must for anyone working in optics. —*Mircea Dragoman*

The Limits of Resolution

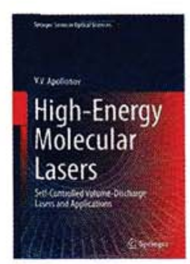
G. de Villers and E.R. Pike, CRC Press, 2016



In the first two chapters, the basic concepts of resolution are presented. The second part—chapters three through nine—covers the mathematical concepts used in resolution theory. In the closing chapters, applications and experiments are scarce. The final chapter is dedicated to resolution in microscopy, where we find the recent results about super-resolution applied in biology, and illustrated by beautiful pictures. —*Daniela Dragoman*

High-Energy Molecular Lasers

V.V. Apollonov, Springer, 2016



This book informs readers about the formation characteristics of a self-controlled volume discharge in order to pump molecular lasers. High-power, self-sustained volume-discharge-based CO_2 laser systems are analyzed and discussed in detail. Further coverage details high-energy lasers—those of various gas mixtures—as well as short-pulse laser systems in particular. Specific applications include high-energy molecular lasers with variable structure of radiation. —*Axel Mainzer Koenig*

K. Alan Shore, Bangor University, U.K. Mircea Dragoman, National Research Institute in Microtechnology, Romania. Daniela Dragoman, University of Bucharest, Romania. Axel Mainzer Koenig, 21st Century Data Analysis, USA.

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