2D Materials
Properties and Devices

Learn about the most recent advances in 2D materials with this comprehensive and accessible text. Providing all the necessary materials science and physics background, leading experts discuss the fundamental properties of a wide range of 2D materials, and their potential applications in electronic, optoelectronic and photonic devices. Several important classes of materials are covered, from more established ones such as graphene, hexagonal boron nitride, and transition metal dichalcogenides, to new and emerging materials such as black phosphorus, silicene, and germanene. You will gain an in-depth understanding of the electronic structure and optical, thermal, mechanical, vibrational, spin, and plasmonic properties of each material, as well as the different techniques that can be used for their synthesis. Presenting a unified perspective on 2D materials, this is an excellent resource for graduate students, researchers, and practitioners working in nanotechnology, nanoelectronics, nanophotonics, condensed matter physics, and chemistry.

Phaedon Avouris is an IBM Fellow Emeritus. He is a member of the National Academy of Sciences, and a Fellow of the American Academy of Arts and Sciences, the American Physical Society, the Institute of Physics, the IEEE, the Materials Research Society, and the American Association for the Advancement of Science.

Tony F. Heinz is a Professor of Applied Physics and Photon Science at Stanford University and the SLAC National Accelerator Laboratory. He previously worked at Columbia University and IBM Research, USA.

Tony Low is Assistant Professor of Electrical and Computer Engineering at the University of Minnesota. He previously worked at Yale University, Columbia University, and the IBM T. J. Watson Research Center.
“This book, edited by the top researchers who have been working on atomically thin materials in the past decade, contains the essential contents of our current scientific understanding of this novel form of materials. The authors have compiled comprehensive and contemporary reviews on various topics ranging from fundamental science to engineering applications, providing an excellent textbook for students as well as references for experts in the research field.”

Philip Kim, Harvard University

“This edited volume consists of 25 topical chapters contributed by scientists active in the growing field of 2D semiconductors, who summarize the most salient features of these intriguing materials. Contributions are grouped into three parts dedicated to graphene, transition metal dichalcogenides, and elemental group V layered semiconductors including phosphorene. Covered are the most actively researched topics: synthesis, stability, thermal and electronic properties including transport, optics, optoelectronics and spintronics, phonon structure, and mechanical properties of few-layer systems including heterostructures, as probed by state-of-the-art experimental and theoretical techniques. While emphasis is placed on the rigorous scientific representation of knowledge acquired to date, the contributors also offer a refreshing insight into potential applications of this new class of materials.”

David Tomanek, Michigan State University

“The field of 2D materials, which started with graphene, now includes dozens of one-atom thick crystals. Many of them demonstrate properties and effects which are equally as exciting as those found for the famous ancestor. And, judging from the recent progress, the field will be developing very fast for many years ahead.

This book, written by scientists who are the leaders in their fields, is the most comprehensive and up-to-date attempt to review this fast-developing subject. Starting with an in-depth summary on graphene, it moves to other 2D crystals, such as transition metal dichalcogenides, black phosphorous, and others, providing probably the most complete reference on the topic at the moment.”

Kostya Novoselov, University of Manchester
2D Materials

Properties and Devices

PHAEDON AVOURIS
IBM T. J. Watson Research Center, New York

TONY F. HEINZ
Stanford University and SLAC National Accelerator Laboratory

TONY LOW
University of Minnesota
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*Contributors*  

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Contributors

Thierry Angot
Aix-Marseille Université

Phaedon Avouris
IBM T. J. Watson Research Center

Alexander A. Balandin
University of California, Riverside

S. Cahangirov
Bilkent University

Luiz Gustavo Cançado
Federal University of Minas Gerais

Andres Castellanos-Gomez
Instituto Madrileño de Estudios Avanzados en Nanociencia

Andrey Chaves
Universidade Federal do Ceará

Jian-Hao Chen
Peking University

S. Ciraci
Bilkent University

Aron W. Cummings
ICN2 – Catalan Institute of Nanoscience and Nanotechnology (CSIC and the Barcelona Institute of Science and Technology)

Cory.R. Dean
Columbia University
Contributors

C. DiMarco
Columbia University

Yuchen Du
Purdue University

Xiangfeng Duan
University of California, Los Angeles

Xidong Duan
Hunan University

Traian Dumitrică
University of Minnesota

Annalisa Fasolino
Radboud University

Dechao Geng
National University of Singapore

Francisco Guinea
Instituto Madrileño de Estudios Avanzados en Nanociencia (IMDEA-nanociencia)

Tony F. Heinz
Stanford University and SLAC National Accelerator Laboratory

J. Hone
Columbia University

Wei Ji
Renmin University of China

Ado Jorio
Federal University of Minas Gerais

Mikhail I. Katsnelson
Radboud University

Andras Kis
École Polytechnique Fédérale de Lausanne (EPFL)

Frank H.L. Koppens
ICFO Institut de Ciències Fotòniques
J.W. Kysar  
Columbia University

Guy Le Lay  
Aix-Marseille Université

Lain-Jong Li  
King Abdullah University of Science and Technology

Mo Li  
University of Minnesota

R. Li  
Columbia University

Han Liu  
Purdue University

Kian Ping Loh  
National University of Singapore

Tony Low  
University of Minnesota

Mark B. Lundeberg  
ICFO Institut de Ciències Fotòniques

Zhe Luo  
Purdue University

Jesse Maassen  
Dalhousie University

Leandro M. Malard  
Federal University of Minas Gerais

Thomas Mueller  
Vienna University of Technology

Frank Ortmann  
Technische Universität Dresden

Marco Polini  
NEST, Istituto Nanoscienze – CNR and Scuola Normale Superiore
Contributors

S. Rastogi
Columbia University

Pasqual Rivera
University of Washington

Stephan Roche
Catalan Institute of Nanoscience and Nanotechnology

Rafael Roldán
Instituto de Ciencia de Materiales de Madrid, CSIC

Eric Salomon
Aix-Marseille Université

Sufei Shi
Rensselaer Polytechnic Institute

Yumeng Shi
Shenzhen University

Sergio O. Valenzuela
Catalan Institute of Nanoscience and Nanotechnology

Chen Wang
University of California, Los Angeles

Feng Wang
University of California, Berkeley

Lei Wang
Cornell University

James R. Williams
University of Maryland

Xianfan Xu
Purdue University

Xiaodong Xu
University of Washington

Wang Yao
The University of Hong Kong
Contributors

Boris I. Yakobson
Rice University

Peide D. Ye
Purdue University

Hongyi Yu
The University of Hong Kong

Xiaolong Zou
Rice University and Tsinghua–Berkeley Shenzhen Institute