Advances in Condensed Matter Physics

Hindawi

Special Issue on

Two-Dimensional Materials Based Optoelectronics

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Recently, originating from the emerging and intensively research of graphene, there have been tremendous improvements in the area of two-dimensional (2D) materials (e.g., graphene, topological insulators, black phosphorus, etc.) based optoelectronics. Their unique and novel characteristics strongly promoted the developments of condensed-matter physics, device physics, photonics, electronics, optoelectronics, and so on.

Comparing with usual three-dimensional bulk materials for optoelectronic device, these new 2D materials are quite different and more flexible. Firstly, the atomic-scale thickness of 2D material decide can greatly reduce the insertion loss of optoelectronic devices. Secondly, electrons are ultimately limited in atomically layers which make electronic properties (such as band-gaps, many-body phenomena) extremely sensitive to structural detail and thickness. One can easily, conveniently, and effectively controls the optoelectronic properties of new 2D materials and select the perfect performance matching specified optoelectronic devices with designed optical characteristics. Thirdly, the 2D materials can be simply stacked on top of each other with various atomic crystals forming multilayer heterostructures. They have been proved to be able to generate some novel and distinctive physics or optoelectronic devices. Also, it is more flexible in manufacturing desirable and given photonics devices and the performance of novel optoelectronic devices can also be greatly boosted.

The purpose of this feature issue is to present the state of recent progresses in the field, from fundamental physics (condensed-matter physics, device physics, etc.) to various applications of the emerging 2D materials. The feature issue covers various aspects of theoretical and experimental researches related to 2D materials based optoelectronics.

Potential topics include but are not limited to the following:

- Physics properties research (optics, electronics, optoelectronics, etc.) of 2D materials
- Device physics of 2D materials
- Fiber laser, solid state laser, and micro/nanolaser
- Photovoltaic, optical modulating devices, and photodetector
- Applications of 2D materials in communications, imaging, and sensing
- Novel optical communication components and devices
- Physical phenomenon (spin, orbital angular momentum, etc.) based on 2D materials

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Lead Guest Editor
Yu Chen, Shenzhen University, Shenzhen, China
yuchen@szu.edu.cn

Guest Editors
Jun Liu, Aston University, Birmingham, UK
liu-jun-1987@live.cn

Jizhou Jiang, National University of Singapore, Singapore
phyjian@nus.edu.sg

Xiaofeng Zhou, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia
xiaofeng.zhou@kaust.edu.sa

Shuqing Chen, Shenzhen University, Shenzhen, China
shuqingchen@szu.edu.cn

Yan Luo, West Virginia University, Morgantown, USA
yan.luo@mail.wvu.edu

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