Advances in Condensed Matter Physics

Special Issue on

Sensors Based on Two-Dimensional Materials

CALL FOR PAPERS

Since the discovery of graphene in 2004, research on atomically-thick two-dimensional (2D) nanomaterials (e.g., graphene, topological insulators, and black phosphorus) has grown exponentially in the fields of condensed matter physics, material science, chemistry, and nanotechnology. Benefiting from the unique physical and chemical properties (e.g., high surface area, unparalleled thermal conductivity, and remarkable biocompatibility), these 2D layered materials have shown great potential in sensing.

Due to their distinct transduction property, 2D materials have been viewed as the most promising materials for the fabrication of rapid and sensitive sensors for basic physical, chemical, and biological quantity detection. The high-quality and low-cost 2D materials have been developed very fast in the past few years, which paved the way for the development of many different 2D material-based sensors. However, researches toward the 2D material-based sensors are still in their infancy and far from real applications due to the difficulties in fabricating devices with good uniformity and reproducibility. Therefore, more effort needs to be paid on the following aspects of this field. Firstly, it is critical to have a better understanding of 2D material on theoretical and experimental facts, as well as detection mechanisms and interactions between nanomaterials and varieties of interfaces, molecules, and cells. Secondly, miniaturization and functionalization of 2D material-based sensors should be investigated to facilitate the fabrication of 2D material-based sensors in arrays that can be used for highly sensitive, selective, and high-throughput sensing. Thirdly, specific detections of the chemical or biological sensors are of critical importance to their practical applications. The reported devices are normally tested in strictly controlled conditions while many interference factors widely existing in real environment have not been considered. So, the selectivity and stability of the 2D material-based sensors need to be characterized and optimized in real-time environment analyzing and in vitro or in vivo biological sensing. Moreover, some unexpected results may come from the impurities or defects of 2D materials. So, the techniques for synthesizing high-quality 2D materials need to be developed. Significant efforts should be devoted to develop facile strategies for controllable, reproducible, and scalable synthesis and functionalization of 2D materials with defined structure and properties.

The purpose of this special issue is to present the state of recent progresses in this field, including new fabrication method of 2D material, 2D material-based sensors, and the various applications of 2D material-based sensors. The special issue covers various aspects of theoretical and experimental researches related to 2D material-based sensors. We welcome all the submissions relating to the recent progress in 2D material-based sensors.

Potential topics include but are not limited to the following:

- 2D material in field-effect transistors for sensors
- 2D materials used for surface enhanced Raman scattering (SERS)
- 2D material-based electrochemical biosensors
- Impedance sensors based on 2D material
- Fluorescence biosensors based on 2D material
- 2D material-based electrochemiluminescence sensor
- 2D material-based fiber optic surface plasmon resonance (SPR) for sensors
- 2D material-based sensors used for basic physical quantity detection

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