

Preface

Over the past few decades, various nanomaterials, such as gold nanoparticles, carbon nanotubes, quantum dots, magnetic beads, polymers, carbon dots, etc., have received intense scientific attention and offered promising applications in biosensing, energy, medicine, imaging, electronics, as well as the interdisciplinary fields, attributing to their unique optical, electrical, chemical, and mechanical properties. However, interests and efforts are always devoted to finding new materials and exploring their new properties to fulfill the ever-increasing needs, and great progress has been achieved in these aspects. As the newly found material, graphene, a single layer of sp^2 -bonded carbon atoms arranged in a two-dimensional honeycomb lattice, has gained scientific attention from all over the world since its first total discovery in 2004 by K.S. Novoselov and A.K. Geim. The unique structure and atom configuration of graphene endows it with outstanding properties, such as large theoretical surface area up to 2,630 m^2/g , high charge carrier mobility at room temperature ($\sim 2.5 \times 10^5$ cm^2/V s), good optical transparency (~ 97.7 %), excellent thermal conductivity (~ 5000 W/m K), high Young's modulus (~ 1.1 TPa), and quantum hall effect, etc., which are much more beneficial for its applications in sensing, energy storage, flexible electronic devices, etc. In the area of sensing, graphene has achieved a great success, but there are hurdles that must be overcome. The main challenges include the exfoliation of high quality single-layer graphene sheets, the prevention of self-aggregation of graphene sheets into a graphite-like structure, the biocompatibility and maximized performance under physiological conditions, which are the main focuses of the current volume.

We present the biocompatible graphene in bioanalytical applications, including the use of simulations and bioinformatics-driven approaches for predictive modeling of the interaction between graphene and biomolecules, various biomaterials decorated graphene based on covalent or non-covalent modes, the enhancement of analytical performances, the effective transduction of recognition event to the detectable signals through optical, electrochemical, mechanical, electronic, and other methods, the effective versatile/multiplexed targets recognition, the cytotoxicity and sophisticated in-vivo imaging, etc. We highlight the recent progress in bioassays toward various targets, for example, DNA, amino acid, peptide, protein,

enzyme, antigen, glucose, DA, AA, UA, ATP, NADH, cell imaging and drug delivery, gas, other molecules and ions, etc. Along this line, particular emphasis is placed on the well-designed strategies for graphene platform construction and target determination. Also, future challenges and prospects of graphene in bioanalytical applications are discussed.

We believe those who wish to have a complete overview of biocompatible graphene in the bioassay fields, wise strategies to decorate graphene, and signal transduction ways to maximize analytical performances, would benefit from this book. Great appreciation is given to all authors, who made great contributions to the book. And, of course, the organizational support from Springer in the production of this book is gratefully acknowledged.

Yuwei Hu
Fenghua Li
Dongxue Han
Li Niu

Biocompatible Graphene for Bioanalytical Applications

Hu, Y.; Li, F.; Han, D.; Niu, L.

2015, VIII, 116 p. 19 illus., 18 illus. in color., Softcover

ISBN: 978-3-662-45694-1