

Science Bridges China Research Profile

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SUMMARY OF MY RELEVANT RESEARCH AREAS:

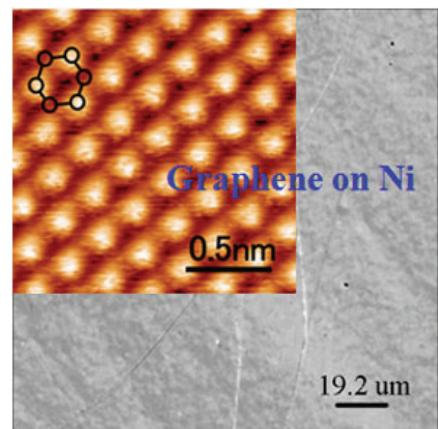
Graphene technologies; Organic/polymer synthesis; Nanomaterials; Organic/polymer optoelectronic devices; Biosensors; Nanotoxicity

石墨烯技术；有机高分子材料的合成；纳米材料；有机高分子光电子器件；生物传感器；纳米材料的安全性研究

Primary Research interests:

We are centered on using chemical and physical engineering approaches towards synthesis and fabrication of advanced materials with novel electronic, photonic, and chemical properties, *ie.*, π -electron materials and optoelectronic devices.

1. Controllable synthesis of graphene and its applications for biological sensors and clean energy. A wide range of applications has been demonstrated for graphene, including biomedicine such as rapid DNA sequencing, and energy generation and storage. Chemical and biological sensors are important for environmental monitoring, disease diagnostics, food processing, and homeland security. The challenges now preventing the use of graphene in practical applications lie in layer- and crystalline structure-controllable synthesis of graphene materials with scalable size.
2. Design and synthesis of novel functional polymers and nanomaterials for clean energy. Our goal is to develop novel organic/polymer materials and technologies for organic solar cells.
3. Nanotoxicity. We focus on the study of potential impact of nanomaterials on environment, health and society (NanoEHS) towards the safe design and synthesis of nanomaterials.



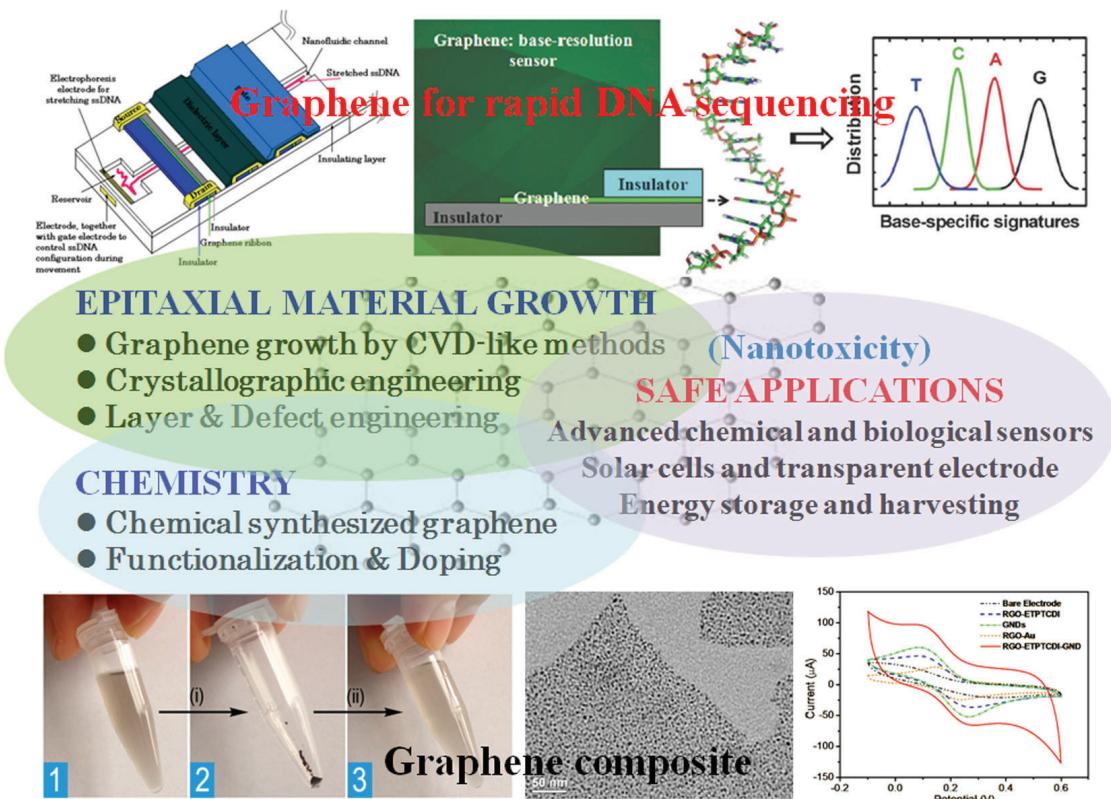
Topics in which you would like to develop collaborative research:

- **Graphene technologies for biosensors, *e.g.*, rapid electronic DNA sequencing, glucose, DNA and protein sensing.**
- **Nanotoxicity, *e.g.*, identification of the key physicochemical characteristics that govern the interaction between nanomaterials and biological system.**

Relevant existing collaborations (academic/clinical/commercial) inside or outside China.

1. Interuniversities MicroElectronic Center (IMEC), Belgium
2. Risø National Laboratory for Sustainable Energy, Technical University of Denmark, Denmark
3. Washington University, USA
4. National Institute for Materials Science (NIMS), Japan

Relevant graphics, figures, pictures:



Development of safe graphene-based materials for healthcare as well as clean energy, including synthesis of graphene materials with fine control of the number of graphene layers and crystal structures, and chemical-derived graphene with special functional groups. High-quality graphene-based materials would allow us to develop chemical and biological sensors such as rapid DNA sequencers that could help to enable the realization of personalized medicine.

Publications and other outputs relevant to your interest in this programme

1. Hongzheng Chen, et al., "Graphene uniformly decorated by gold nanodots: in-situ synthesis, enhanced dispersibility and its applications", *J. Mater. Chem.* 21, 8096-8103 (2011).
2. Mingsheng Xu, et al., "Production of extended single-layer graphene", *ACS Nano* 5, 1522-1528 (2011).
3. Mingsheng Xu, et al., "Contribution of physicochemical characteristics of nano-oxides to cytotoxicity", *Biomaterials* 31, 8022-31 (2010).
4. Mingsheng Xu, et al., "Perspective and challenges of emerging single-molecule DNA sequencing technologies", *Small* 5, 2638-2649 (2009).
5. Mingsheng Xu, et al., "Nanopore electrical sensor", Pub. No. WO2011/047582 (pending patent)