报告一：Synthesis and Applications of Novel Two-Dimensional Nanomaterials
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Abstract

In this talk, I will summarize the recent research on synthesis, characterization and applications of two-dimensional nanomaterials in my group. I will introduce the synthesis and characterization of novel low-dimensional nanomaterials, such as graphene-based composites including the first-time synthesized hexagonal-close packed (*hcp*) Au nanosheets (AuSSs) on graphene oxide, surface-induced phase transformation of AuSSs from *hcp* to face-centered cubic (*fcc*) structures, the synthesis of ultrathin *fcc* Au@Pt and Au@Pd rhombic nanoplates through the epitaxial growth of Pt and Pd on the *hcp* AuSSs, respectively, the first-time synthesis of 4H hexagonal phase Au nanoribbons (NRBs) and their phase transformation to *fcc* Au RNBs as well as the epitaxial growth of Ag, Pt and Pd on 4H Au NRBs to form the 4H/*fcc* Au@Ag, Au@Pt and Au@Pd core–shell NRBs, and the epitaxial growth of metal and semiconductor nanostructures on solution-processable transition metal dichalcogenide (TMD) nanoshees at ambient conditions, single- or few-layer metal dichalcogenide nanosheets and hybrid nanomaterials, the large-amount, uniform, ultrathin metal sulfide and selenide nanocrystals, other 2D nanomaterials, nanodots prepared from 2D nanomaterials, and self-assembled 2D nanosheets and chiral nanofibers from ultrathin low-dimensional nanomaterials. Then I will demonstrate the applications of these novel nanomaterials in chemical and bio-sensors, solar cells, water splitting, hydrogen evolution reaction, electric devices, memory devices, conductive electrodes, other clean energy, etc.

Keywords: Two-dimensional nanomaterials; Graphene; Metal dichalcogenides; Nanodevices; Field-effect transistors; Sensors; Clean energy

Brief CV

Dr. Hua Zhang obtained his B.S. and M.S. degrees at Nanjing University in China in 1992 and 1995, respectively, and completed his Ph.D. with Prof. Zhongfan Liu at Peking University in China in July 1998. He joined Prof. Frans C. De Schryver's group at Katholieke Universiteit Leuven (KULeuven) in Belgium as a Research Associate in January 1999. Then he moved to Prof. Chad A. Mirkin's group at Northwestern University as a Postdoctoral Fellow in July 2001. He started to work at NanoInk Inc. (USA) as a Research Scientist/Chemist in August 2003. After that, he worked as a Senior Research Scientist at Institute of Bioengineering and Nanotechnology in Singapore from November 2005 to July 2006. Then he joined the School of Materials Science and Engineering in Nanyang Technological University (NTU) as an Assistant Professor. He was promoted to a tenured Associate Professor on March 1, 2011, and Full Professor on Sept. 1, 2013.

He has published **5** invited book chapters, **64** patent applications (including **8 granted US patents**), and over **360** papers, among which **330** papers were published in the journals with **IF>3** (including **140** papers published in **IF>10** journals and **66** papers published in **8<IF<10** journals). Some of his papers have been

published in ***Science*** (1)***, Nat. Chem.*** (3)***, Nat. Commun.*** (6)***, Sci. Adv.*** (1)***, Chem. Soc. Rev.*** (8)***, Acc. Chem. Res.*** (1)***, J. Am. Chem. Soc.*** (12)***, Angew. Chem. Int. Ed.*** (22)***, Adv. Mater.*** (26)***, Nano Lett.*** (12)***, ACS Nano*** (24)***, Energy Environ. Sci*** (12)***, Adv. Energy Mater.*** (5)***, Adv. Funct. Mater.*** (3)***,*** *etc.* Based on *Web of Science* on June 2, 2016, the total citation times of his papers are over **26,000** with H-index of **79**. He has been invited to give more than **260** Plenary, Keynote or Invited Talks in international conferences, universities and institutes, and serve as the Session Chair. He has organized several tens of international conferences and served as the Symposium Chair or Conference Co-Chair. He is one of three Chairmen of the Editorial Board of ***ChemNanoMat*** (2015-) and an Associate Editor of ***International Journal of Nanoscience*** (2007-), sits on the Advisory Board of ***Chem. Soc. Rev.*** (2012-), ***Nanoscale*** (2012-) and ***Nanoscale Horizons*** (2015-), the Editorial Advisory Board of ***ACS Nano*** (2014-), ***Chem. Mater.*** (2014-), ***ACS Appl. Mater. Interfaces*** (2014-), ***Small*** (2012-) and ***Nanofabrication*** (2012-), the Editorial Board of ***CHEM*** (2016-), ***Carbon*** (2013-), ***Applied Materials Today*** (2015-), ***Energy Storage Materials*** (2015-), ***NANO*** (2007-), ***Chinese Science Bulletin*** (2014-), ***Science China Materials*** (2014-) and ***Graphene Technology*** (2016-), and the International Advisory Board of ***Materials Research Express*** (2014-) and ***ChemPlusChem*** (2012-). He is also one of the members of the Advisory Committee of ***IOP Asia-Pacific*** (2010-). In **2015**, he was elected as an ***Academician*** of the Asia Pacific Academy of Materials (APAM). In Nov. **2014**, he was elected as a ***Fellow of the Royal Society of Chemistry*** (*FRSC*). Recently, he was listed in the "*Highly Cited Researchers 2015*" in *Chemistry* and *Materials Science*, and also listed as **one of 19** "*Hottest Researchers of Today*" in the world in the *World's Most Influential Scientific Minds 2015* (Thomson Reuters, **2015**). In **2014**, he was listed in the "*Highly Cited Researchers 2014*" in *Materials Science*, and also listed as **one of 17** "*Hottest Researchers of Today*" and **No. 1** in *Materials and More* in the world in the *World's Most Influential Scientific Minds 2014* (Thomson Reuters, **2014**). Moreover, he got the *Young Investigator Award* (Young Giants of Nanoscience 2016, Hong Kong), *Vice-Chancellor's International Scholar Award* (University of Wollongong, Australia, **2016**), *ACS Nano Lectureship Award* (**2015**), *World Cultural Council (WCC) Special Recognition Award* (**2013**), the *ONASSIA Foundation Lectureship* (Greece, **2013**), *Asian Rising Stars* (15th Asian Chemical Congress, **2013**), *SMALL Young Innovator Award* (Wiley-VCH, **2012**) and *Nanyang Award for Research Excellence* (**2011**).

Dr. Zhang's research is highly interdisciplinary. His current research interests focus on synthesis of two-dimensional nanomaterials (graphene and transition metal dichalcogenides), carbon materials (graphene and CNTs) and their hybrid composites for various applications in nano- and biosensors, clean energy, water remediation, *etc.*; controlled synthesis, characterization and application of novel metallic and semiconducting nanomaterials; scanning probe microscopy; lithography-based fabrication of surface structures from micro- to nanometer scale; self-assembly and self-organization of nano- and biomaterials; self-assembled monolayers; *etc.*