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LowDimensional Metal ChalcogenideSemiconductors:Design, Synthesis and Applications

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Prof. He received his PhD in Semiconductor Physics from the Institute of Semiconductors, Chinese Academy of Sciences (CAS), in 2003. Then he joined Applied Physics Department of TechnischeUniversiteit Eindhoven, Netherlands, as a postdoctoral fellow. From 2005 to 2007, he worked as a postdoctoral fellow at Material Department of University of California, Santa Babara, USA. From 2007 to 2010, he worked at California NanoSystemInsitute (CNSI), University of California, Los Angeles, USA, as a research scientist. He joined the “100-Talents” Program of CAS in Nov. 2010 and became a Full Professor of NCNST

While scaling the dimension(s) of semiconductors down to nanoscale, novel properties, such as ultrahigh specific surfaces and strong electrostatic tunability, will show up. Among the various low dimensional structures, two-dimensional (2D) semiconductors may lead the next generation of electronics and optoelectronics due to their compatibility with traditional micro-fabrication techniques and flexible substrates. Up to now, both layered and non-layered materials have been demonstrated to present in 2D configuration. For the former, even though big breakthroughs, especially on transition metal dichalcogenides (TMDCs), have been made, more systematical and deeper studies are needed. In addition, inspired by the success of 2D layered materials and the fact that many materials with significant functions have non-layered crystal structures, 2D non-layered materials have attracted increasing attentions. Based on above challenges and motivations, our research focuses on the design, synthesis and applications of low dimensional metal chalcogenides semiconductors. In this talk, I will present our recent progress on the following two aspects:

(1) 2D layered metal chalcogenide semiconductors: controllable synthesis, properties, electronic and optoelectronic applications. [1-9]

(2) Van der Waals epitaxial growth, electronic and optoelectronic properties of 2D non-layered materials, such as Te, $Pb_{1-x}Sn_xSe$, and PbSnanosheets. [10-17]

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