# 北京大学量子材料科学中心

## International Center for Quantum Materials, PKU

## Seminar

# Atomically precise graphene nanoribbons

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**Time: 4:00pm, Dec. 28, 2015 (Monday)**

**时间：2015年12月28日 （周一)下午4:00**

**Venue: Room W563, Physics Building, Peking University**

**地点：北京大学物理学院，西楼563会议室**

## Abstract

Atomically precise graphene nanoribbons (GNR) represent a conceptually new class of materials that, by quantum confinement and edge effects, exhibit semiconducting bandgaps and magnetic edge states. Taking advantage of recent development of surface chemistry [1], state-of-the-art non-contact atomic force microscope (nc-AFM) techniques and scanning tunneling microscope (STM) manipulations, we thoroughly investigated different on-surface synthesized GNRs: armchair GNRs of width N=7 [2], armchair GNRs of width N=14 [3], and zigzag GNRs of width N=6 [4].
High-resolution nc-AFM is used to resolve the chemical structure of GNRs. This is achieved by picking up a single CO molecule at the apex of Q-plus tip. To probe the intrinsic electronic properties of GNRs, we establish a STM manipulation routine, which allows transferring ribbons with length from 3 nm to 10 nm in situ onto various nanostructures such as NaCl islands. The detailed electronic structure of GNRs is investigated via scanning tunneling spectroscopy in combination of ab initio calculations. The results unambiguously answer some of the fundamental questions of graphene nanoribbons, e.g., the value of fundamental bandgap, energy splitting of magnetic edge states.

[1] J. Cai et al., Atomically precise bottom-up fabrication of gaphene nanoribbons, Nature 466, 470 (2010).
[2] S. Wang et al., Giant edge state splitting at atomically precise graphene zigzag edges, submitted.
[3] S. Wang et al., Electronic structure of metallic armchair graphene nanoribbons, in preparation.
[4] P. Ruffieux et al., On-surface synthesis of graphene nanoribbons with zigzag edge topology, Nature, Accepted.

## About the Speaker

Shiyong Wang received his B.S. degree in Electronic Information Science & Technology from 2005 to 2009 in University of Electronic Science and Technology of China, and got his Ph.D degree in Physics from 2009 to 2013 in Hong Kong University of Science and Technology. Since 2013, he has been a Postdoctoral Fellow in Swiss Federal Laboratories for Materials Science and Technology (EMPA), Switzerland. Shiyong Wang currently focuses his research on sp2 derived carbon-based nanostructures. These structures encompass molecular nanographenes (zero dimensional structure), carbon nanotubes and nanoribbons (1D structure) and porous graphene (2D structure). He puts particular emphasis on engineering the electronic properties of these materials, which are achieved either by bottom-up synthesis of particular, structurally precise atomic configurations or by local modification using structural defects or chemical functionalization.