北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

TSiGe quantum dots and nanowires on Si(001): fundamentals and applications

Jianjun Zhang

the Centre for Quantum Computation and Communication Technology at University of New South Wales

Time: 4:00pm, May. 30, 2013 (Thursday)
时间： 2013年5月30日（周四）下午4:00
Venue: Room 607, Science Building 5
地点： 理科五号楼607会议室

Abstract

Ge nanostructures on Si(001) are interesting not only for understanding fundamental properties of heteroepitaxial growth but also for their applications in electronic and thermoelectric devices. Firstly, I will talk about the site-controlled growth of ordered SiGe islands and the first demonstrated devices with tensile strained Si channel on top of buried SiGe islands with enhanced electron mobility, and then the growth of closely spaced SiGe islands to induce compressive strain in Si regions between islands for achieving a high hole mobility. Secondly, I will report on a new method to directly and horizontally grow micron-long Ge nanowires on Si(001) with a height of only 3 unit cells. First transistor-type devices made from single wires show low-resistive electrical contacts and single hole transport. Such Ge wires hold promise for observing exotic quantum states, like Majorana fermions, and provide a new development route for silicon-based nanoelectronics. Lastly, I will show you novel 1D Ge nanostructures, such as nanowire bundles, dumbbells, matchsticks and dot chains, observed by carefully tuning the strain fields.

About the Speaker

Jianjun Zhang received his Bachelor and Master in Physics both from Xiangtan University in 2001 and 2004, respectively. He went to Europe in 2005 and did his joint PhD in Max Planck Institute for Solid State Research and Johannes Kepler University Linz. He is currently a vice-chancellor research fellow in the Centre for Quantum Computation and Communication Technology at University of New South Wales. The main interests of his research include the growth and characterization of novel SiGe nanostructures and their device applications in nanoelectronics and thermoelectrics. He has extended the Stranski–Krastanow growth of quantum dots to one-dimensional nanowires, which had escaped from 22 years of research on Ge/Si(001).