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Developing control system for neutral beam injector in EAST tokamak

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The control system of Neutral Beam Injector (NBICS) is developed in accordance with the experimental operational characteristics of the EAST-NBI system. NBICS is based on the computer network technologies and classified according to the control levels, consists of three levels: a remote monitoring level, a server control level, and a field control level. The 3-layer architecture is capable of extending the system functions and upgrading devices. The chosen platform is a CPCI-based and PXI-based computerized network system. In each beam-line, there are three PXI/CPCI crates housing several boards for performing analogue signal acquisition, analogue voltage generation, signal conditioning, digital input detection and digital output generation. NBI Data Acquisition System consists of field instrument and measurement devices, servers and remote data processing terminals. Two server computers running CentOS 6.3 operating system act as control server and data server respectively. A virtual instrument for the timing system is developed with LabVIEW 2010 on the PXI-based platform. Both of the ion sources of a beam-line are designed to operate independently. Experimental results demonstrate that the visualization and automation of NBI experimental operations are successfully implemented by using the functions of remote monitoring, interlock protection, and data processing.

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Nanowire-based semiconductor hybrid nanostructures for quantum applications

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One-dimensional semiconductor nanowire materials have attracted increasing attention in the last decade due to their unique functionalities and the promising potential as new building blocks for next generation devices. Of particular interest is the III-V compound semiconductors nanowire-based nanostructures. For instance, the core-shell nanowires, dots-in-nanowires, nanowires/organic hybrid blends. This talk will present our recent research progress on several novel semiconductor nanostructures grown by using catalyst-free molecular beam epitaxy and their device applications. Through optimising a novel droplet-assisted epitaxy, we successfully synthesized GaSb/GaAs dots-in-nanowires, InAsSb/InAs superlattice nanowires, type II InAsSb/AlGaSb, type I InAs/InAsGaAs/AlInAs core-shell nanowires, which have potential in quantum detection and single photo emissions. The growth mechanisms will be discussed in droplet-assisted epitaxy followed by structural details investigated by X-ray diffraction, scanning electron microscope and high-resolution transmission electron microscope. The optical properties were also exploited by photoluminescence spectroscopy. The demonstration of these high quality nanowires showing advanced optical properties paves the route to realize quantum devices based on nanowires. In addition, the integration of such nanostructures with silicon and graphene will be also discussed.

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