El grupo de Nanotecnología de la USAL presenta

Novel quantum phenomena in nanostructured InAs/GaInSb superlattices

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Abstract

Dr. Patrashin will present a novel approach for engineering Dirac semimetal states in InAs/GaInSb superlattice (SL) materials. The synthesized materials employ the quantum confinement effects in InAs/GaInSb superlattices (SL), which have a unique "broken gap" energy lineup at the InAs and GaInSb interfaces. The quantum confinement effects are used for a controlled hybridization of the electronic states in the host materials for engineering a gapless semimetal state in a synthesized SL crystal with a linear energy-momentum dispersion near the Brillouin zone center. Topological transitions from a conventional narrow-gap semiconductor phase to a gapless semimetal phase depending on the thickness and composition of the SL layers are theoretically studied using the multiband k·p method, which is also used to determine the design parameters of experimental SL structures. The samples of InAs/GaInSb SL single crystals are grown by molecular beam epitaxy on (100) GaSb substrates. In this presentation, I will describe the SL design, material growth, and characterization of structural, optical, and electron transport properties of the materials.

Biography

Mikhail Patrashin received the Ph.D. degree in semiconductor device physics from the Institute of Radio-Engineering and Electronics, Russia, in 1995. He joined the National Institute of Information and Communications Technology (NICT), Tokyo, Japan, in 2004. He is a Senior Researcher in the Frontier Research Laboratory, where he is involved in the design, MBE growth, fabrication and characterization of nanostructured devices and materials based on compound semiconductors

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