Zhenyang Zhong, J Material Sci Eng 2012, 1:3
http://dx.doi.org/10.4172/2169-0022.S1.004

OMICS Group Conferences
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International Conference and Expo on
Materials Science & Engineering

October 22-24, 2012 DoubleTree by Hilton Chicago-North Shore, USA

Controlled GeSi nanoislands: Fabrication and properties

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Self-assembled GeSi nanoislands on Si substrates have been extensively investigated not only for their promising applications in devices compatible with the sophisticated Si integration technology, but also to understand the fundamental physics during strained heterostructure growth. However, the stochastic formation of GeSi nanoislands on flat substrates results in a random spatial distribution and a big size inhomogeneity. Such disadvantages hinder to fully characterize the nanoislands and exploit them in novel devices. The discovery of preferential formation of GeSi nanoislands within small trenches or pits provides a feasible route to precisely control these nanoislands in location, size and etc. The patterned Si substrates with trenches or pits can be fabricated by holographic lithography, electron beam lithography, nanosphere lithography, and etc. The controlled GeSi nanoislands can be readily obtained via self-assembly of Ge on patterned Si substrates with trenches or pits, where are energetically favorable for GeSi nanoislands under the assistance of growth kinetics. The unique structural features of such controlled GeSi nanoislands, including precise site location and good size homogeneity, make them be excellent candidates for systematic study of the quantum confinement effect on a single nanoisland and the collective properties of quantum dot crystal. In addition, the controlled nanoislands may act as photonic crystals in the case of periodic arrangement, considering the periodic distribution of dielectric constant. These controlled GeSi nanoislands will have potential applications in novel devices.

Biography

Zhenyang Zhong has completed his Ph.D at the age of 29 years from Institute of Physics, Chinese Academy of Science, Beijing, China and postdoctoral studies from Johannes Kepler University, Linz, Austria and Max Planck Institute for Solid State Research, Stuttgart, German. He is the professor in Department of Physics, Fudan University, Shanghai, China. He has published 39 papers in reputed journals and serving as an editorial board member of Journal of Material Sciences & Engineering.

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