HRTEM CHARACTERISATION OF Bi QD'S IN ANNEALED GaAsBi/AlAs MQW STRUCTURE

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High Resolution Transmission Electron Microscopy (HRTEM) is the premier tool for understanding of the internal microstructure of materials at nanometer level. This method allows to distinguish real-space nano-scale peculiarities in material, and simultaneously from Fast Fourier Transform (FFT) diffraction patterns obtain the information about crystalline lattice of the investigated specific regions in the nanostructures, such us, nanoparticles, quantum dots, etc.

In this work, MBE grown and thermally treated GaAsBi/AlAs quantum wells were studied by structural (High-Resolution Transmission Electron Microscopy, HRTEM) characterization. The analysis of profile of GaAsBi/AlAs QWs containing Bi-nanoparticles measured by HRTEM and Scanning Transmission Electron Microscopy in High-Angle Annular Dark-Field (STEM HAADF) mode were performed to evaluate the influence of annealing on orientation of nanoparticles and strain distribution in whole quantum structure. Fast Fourier transform (FFT) analysis of HRTEM micrographs confirmed that Bi Quantum dots consist of pure rh-Bi phase, distributed in random orientation in zinc blende GaAsBi phase. EDX mapping and STEM HAADF further confirmed that these QD‘s consist of pure Bi. Furthermore, Geometric phase analysis also showed that GaAsBi layers are strained with respect to AlAs, while Bi Quantum dots are fully relaxed.

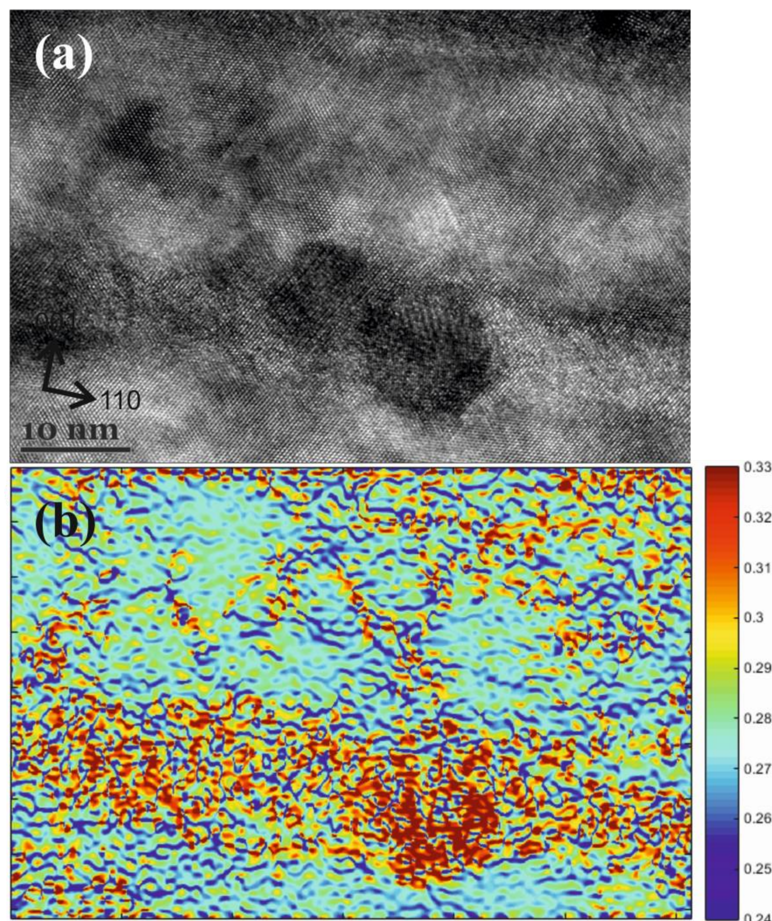

Fig. 1 HRTEM micrograph of Bi QD (a), and corresponding d_{002} interplanar spacing map

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