the ripening time.

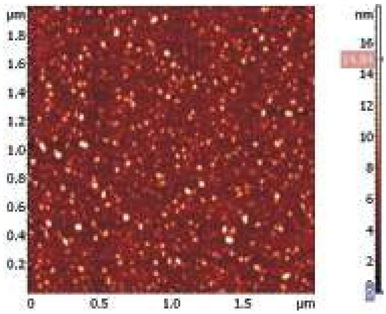

Fig L.10.1 : AFM picture of InAs QD

Figure L.10.1 shows an AFM scan of the optimized QD sample where a QD density of about $2x10^{10}$ cm^{-2} was obtained. The typical QD diameter was about 30 nm with the height of about 15 nm under optimized MOVPE growth conditions.

b. InP quantum dots :

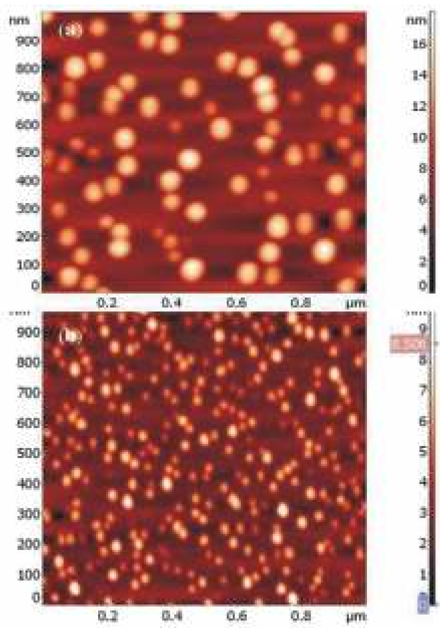

Fig.L.10.2 : AFM pictures of InP QD grown at a temperatures of (a) 600^{0}C and (b) 550^{0}C

InP self-assembled quantum dots (QDs) have been grown on a nominally (001) oriented n^+-GaAs substrate through Stranski-Krastanov growth mode. InP/GaAs QD system has type-II band alignment, where only electrons are confined in the QD region while holes are in the GaAs barrier regions. Structural properties of the InP QDs were optimized by varying the InP coverage, growth temperature, V/III ratio, growth rate etc. Variation of growth temperature on the structural properties of InP QD are shown in Fig.L.10.2, where it was observed that the QD size decreases while the density increases with the decrease in growth temperature.

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L.11 : Ab initio study of the electronic and geometric structures of ultra-small single-walled nanotubes

All-electron calculations based on density functional theory have been carried out at Semiconductor Laser Section to study the electronic structures of single walled nanotubes with sub-nanometer diameters. Our studies emphasize the need for performing all-electron calculations, specifically for the nanotubes with very small diameters. A complete geometry optimization is found to be very crucial for predicting the correct electronic properties of these tubes. In the band structures of these tubes, systematic variations of a nearly-free-electron-like-state and a nearly-dispersion-free-state are observed as a function of n. From this one is able to indicate the possibility of accumulation of a *large density of states at the Fermi level*, after moderate hole or electron doping, in some of these tubes, which make them interesting for further probing. The Fermi surfaces calculated for the metallic SWCNTs show the signature of a collection of *quasi-Fermi-points*. This clearly shows the quasi-one-dimensional nature of these tubes [For more details, please see: *C. Kamal et al, Phys. Rev. B, 76, 075113, 2007*].

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L.12 : Development of zinc sulphide blanks and domes using chemical vapour deposition technique

Zinc Sulphide (ZnS), due to its transparency in the infrared region (8-12 μm range) and good mechanical strength, is used as protective windows to shield high quality infrared imaging systems on airborne platforms and as infrared optical elements. At Laser Materials & Device Development Division of RRCAT, sub-atmospheric pressure Chemical Vapour Deposition (CVD) process has been successfully implemented to produce dense, highly pure, crystalline ZnS blanks and domes of aperture size up to 80 mm. A schematic of homemade CVD reactor is shown in Fig. L.12.1.