

Abstract Submitted
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Wavelength engineered InAs quantum dots MUHAMMAD USMAN, GERHARD KLIMECK, Network for computational nanotechnology, Electrical and Computer Engineering Department, Purdue University, West Lafayette IN — Considerable efforts have been devoted in the wavelength tuning of InAs quantum dots for optical fiber based communication systems [1]. Experimentalists have tried to achieve $1.5\mu\text{m}$ range emissions through strain engineering or by insertion of nitrogen. In former method, covering the InAs quantum dots with an InGaAs capping layer, one can achieve considerable red shift in the emission spectra. Here, we use a full twenty band tight binding method [2] to quantitatively reproduce experimentally observed emission spectra. Detailed critical analysis of the red shift reveals new insights: QD changes its shape and In-As bimodal bond distribution is not valid. The quantitative simulation agreement with experiment without any material or geometry parameter adjustment in a general atomistic tool predicts that the era of nano Technology Computer Aided Design (nano-TCAD) is approaching.

[1] J. Crystal Growth (2008); J. Crystal Growth 275 pp. 415-421 (2005); J. Appl. Phys. Lett. 78, 3469 (2001); J. Crystal Growth 298 pp. 582-585 (2007)

[2] IEEE Trans. on Nanotechnology, Vol. 8, No. 3, May 2009, pp. 330-344

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