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Oblique angle deposited InN quantum dots array for infrared detection

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Abstract:

Indium Nitride (InN) quantum dots (QDs) were synthesized on Si substrate by oblique angle deposition method. The deposited InN QDs were of the order of 5-50 nm in diameter with density $\sim 7 \times 10^9/\text{cm}^2$. The synthesized InN QDs were nearly single crystalline, confirmed from the diffraction peak in the $\langle 110 \rangle$ direction. Photoluminescence (PL) measurement showed peak emission at ~ 1138 nm (1.08 eV) at 19 K. The PL emission energy exhibited blue shift and the intensity reduced with an increase in temperature. The high optical band gap emission of the InN QDs is possibly due to energy level quantization resulted from size reduction. The free carrier concentration was found to be $\sim 2 \times 10^{18} \text{ cm}^{-3}$. The device selectively detected the 1080 nm (1.13 eV) wavelength with maximum responsivity near the optical band edge at 10 K and room temperature (300 K) respectively. The external quantum efficiency of ~ 4.1 %

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