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Effects of $GaAs/In_{0.1}Ga_{0.9}As$ strained layer on the optical properties of multiple-stacked InAs/GaAs quantum dots

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Multiple-stacked InAs/GaAs quantum dots (QDs) were grown by molecular beam epitaxy (MBE) and their optical properties were investigated by photoluminescence (PL) spectroscopy. To investigate the effects of GaAs(2 nm)/$In_{0.1}Ga_{0.9}As$(2 nm) strained layer on the optical properties of multiple-stacked InAs/GaAs QDs, the 10 periods of the $GaAs/In_{0.1}Ga_{0.9}As$ strained layer was grown on the GaAs buffer layer and InAs QDs layer, respectively. The PL peak positions of the multiple-stacked GaAs/InAs QDs embedded in $GaAs/In_{0.1}Ga_{0.9}As$ strained layer were blue-shifted with narrowing of the full width at half maximum (FWHM) compared to that of multiple-stacked GaAs/InAs QDs embedded in GaAs barriers. The rapid thermal annealing (RTA) treatments on the InAs QDs embedded in the GaAs/ $In_{0.1}Ga_{0.9}As$ strained layer were performed for 30 s at temperature ranging from 600 ℃ to 850 ℃. The PL spectra of the InAs QDs show blue-shifts of about 50 meV with increasing annealing temperature up to 850 ℃. At annealing temperature of 600 ℃, the FWHM of the PL peak is reduced to 16 meV and PL intensity is enhanced compared to those of the as-grown sample, which indicates improvement of size uniformity and crystal quality of the QDs.