

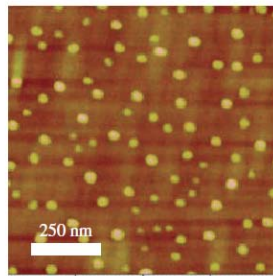
# The Influence of As on the Morphologies and Optical Characteristics of GaSb/GaAs Quantum Dots

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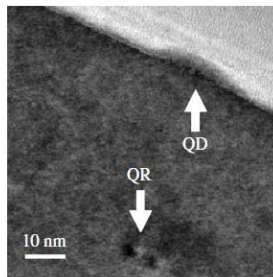
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The influence of As atoms on the morphologies of GaSb quantum dots (QDs) is investigated. Without any special treatment, GaSb quantum rings (QRs) are observed in the embedded GaSb layer even when the uncapped layer reveals QD-like morphologies. With intentional As supply after the uncapped GaSb QD deposition, QD-to-QR transition is observed. The phenomenon suggests that insufficient Sb atoms on the GaSb QDs would lead to QD-to-QR transition as in the case of embedded GaSb layers. With extended Sb soaking time following GaSb deposition, QD structures could be well maintained for the embedded GaSb layers. A light-emitting diode operated at room temperature is fabricated based on the GaSb/GaAs QD structure. The identical peak positions of photoluminescence (PL) and electro-luminescence (EL) spectrums of the device have revealed that the type-II GaSb QDs are responsible for the observed EL.



(a)



(b)

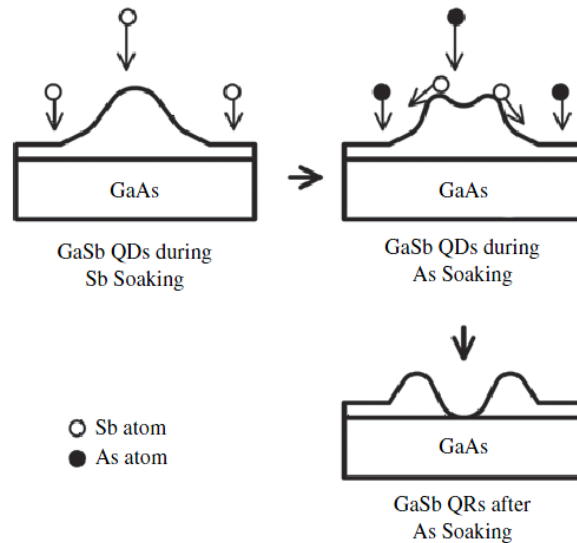


Fig. 3. Cross-sectional schematics describing the QR growth evolution with As exposure.

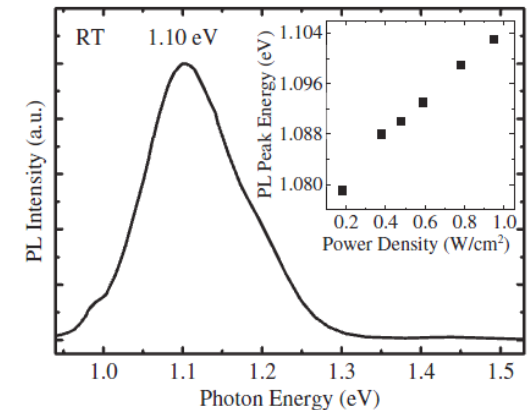


Fig. 5. Room-temperature PL spectrum of the sample with 120 s soaking time measured at an excitation power density  $0.95 \text{ W/cm}^2$ . The PL peak energies under different excitation power densities are shown in the inset.