

In-situ OBSERVATION OF InAs/GaAs QUANTUM DOTS USING THE MAGNIFICATION INFERRED CURVATURE METHOD

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The growth of InAs on GaAs substrates follows the Stranski-Krastanov (S-K) growth mode[1]. The stress is minimal at the beginning of growth, leading to layer-by-layer growth. As the grown layer becomes thicker, the stress accumulates, and upon reaching a critical thickness, the growth transitions to island growth. Meanwhile, the change in strain during crystal growth can be observed through the change in curvature of the substrate. However, in InAs/GaAs growth, this change is minimal, making its observation difficult. In this work, we report the successful observation of strain changes during the formation and relaxation processes of quantum dots (QDs) by applying the Magnification Inferred Curvature (MIC) method[2] in Molecular Beam Epitaxy growth, which allows for highly accurate estimation of substrate curvature. InAs was grown on the GaAs substrate. The substrate's surface state and curvature were simultaneously observed with RHEED and MIC. Figure shows the brightness of the InAs 004 diffraction spot and the curvature of substrate during the growth process. Point 1 indicates the moment when the cell shutter opens, initiating the supply of In, while point 2 marks the transition from layer growth to island growth. Point 3 corresponds to the peak brightness of the diffraction spot and point 4 represents the moment when the cell shutter closes. This suggests that layer growth, the formation of islands, the growth of islands, and the ripening of islands occur sequentially after each respective point. These results demonstrate the usefulness of the MIC method for in-situ observation of the S-K growth mode.