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Diffuse X-ray Scattering as a Tool to Characterize Morphology of Multilayered Structures of Ultra-small (Submonolayer) Quantum Dots¹ SIDDHARTH DHOMKAR, The Graduate Center and Queens College of CUNY, NICOLAS VAXELAIRE, I.C. NOYAN, Department of Applied Physics and Applied Mathematics, Columbia University, HAOJIE JI, IGOR KUSKOVSKY, The Graduate Center and Queens College of CUNY, VASILIOS DELIGIANNAKIS, MARIA TAMARGO, The Graduate Center and City College of CUNY, JEAN JORDAN-SWEET, National Synchrotron Light Source, IBM — Characterization of submonolayer quantum dots (QDs) (i.e., QDs formed from deposition of less than a monolayer of material) is challenging due to their small size and a low electron density contrast between the embedded QDs and the host. For example, our samples have ZnTe/ZnSe type-II submonolayer QDs grown via migration enhanced epitaxy, in which the contrast between Te- and Se-containing sublattices is very low. We have devised a systematic diffraction analysis to obtain quantitative structural information about such hard-to-image systems. In this procedure, a large portion of the reciprocal space is mapped to acquire both out-of-plane and in-plane information. Vertical self-ordering of QDs is determined from out-of-plane and non-specular reflectivity maps, while diffuse scattering analysis is used to check in-plane correlations. This work greatly enhances the potential for extracting structural information of complex embedded 3D QD structures.

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