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Integrated colloidal nanocrystal and epitaxical quantum nanostructures ATUL KONKAR, SIYUAN LU, YI ZHANG, ANUPAM MADHUKAR, University of Southern California — Colloidal semiconductor nanocrystals (NCs) and epitaxically grown semiconductor quantum wells, wires, and dots represent two classes of quantum nanostructures which currently serve complementary purposes, the former being well suited for biological applications the latter for electronic and optoelectronic systems as applied to non-hazardous environments. In this work we report on the integration of InAs NCs with InGaAs/GaAs epitaxy based nanostructures through overgrowth on the NCs. We report on the cleaning conditions needed to remove the chemical contamination arising from the solvent during deposition of the NCs on GaAs, the reduction of the as-deposited NC sizes due to the Kelvin effect during thermal treatment, and the GaAs molecular beam epitaxical overgrowth. High-resolution transmission electron microscopy and photoluminescence spectroscopy examinations reveal high quality overgrowth, thus opening the study of a new class of integrated quantum nanostructures that can provide unprecedented functionalities not to be found in either component. Work supported by DARPA/AFOSR under the DURINT program.

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