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QUANTUM DOTS GROWN BY METALORGANIC VAPOR PHASE EPITAXY

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This paper focuses on quantum dots (QDs) embedded inside semiconductor heterostructures prepared by Metalorganic Vapor Phase Epitaxy (MOVPE) technology and is based on our contribution in [1].
Light emission from atoms/molecules in a glass matrix or in gas is strongly monochromatic. Semiconductor direct-bandgap materials have much higher energy conversion efficiency than the other light sources, but they have a broad band or multimode light emission spectra. QDs inside semiconductor heterostructures can fundamentally improve the quality of spectrum, temperature dependencies and also light efficiency emission.
The main technological procedure used for MOVPE preparation of QDs embedded inside the heterostructure is self-assembled Stranski–Krastanov growth mode. Growth procedures and parameters will be briefly described.
Mostly used material combination for embedded QDs is InAs QDs in a GaAs matrix.
Embedded MOVPE-prepared QDs are currently used for semiconductor lasers, optical amplifiers, LEDs and photodetectors. High extinction coefficient of QDs is promising for possible optical applications. QDs can operate like a single-electron transistor and show the Coulomb blockade effect. QDs have also been suggested for quantum information processing . QD technology is relevant to solid-state quantum computation .
[1] Metalorganic Vapor Phase Epitaxy (MOVPE): Growth, Materials Properties and Applications", edited by S.J.C. Irvine and P. Capper, published by Wiley (John Wiley Sons) 2019, autumn.

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