Directed Self-Assembly of Single Quantum Dot Optical Devices

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Progess on controlling the nucleation site of a single InAs/InP quantum dot is discussed. The deterministic approach, with its a priori knowledge of the quantum dot position, leads to straight forward fabrication of gated single dot structures and coupled dot-cavity systems using standard alignment techniques. Examples are given of deterministically nucleated single dots in vertical and lateral electric fields and in high finesse optical microcavities. Such devices form the basis of efficient sources of single photons and entangled photon pairs and their implementation using deterministically nucleated quantum dots is described.