

Exciton-polariton condensation in semiconductor microstructures

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Exciton polaritons in high-quality semiconductor microcavities with embedded quantum wells are composite bosonic quasiparticles that result from strong coupling between cavity photons and quantum-well excitons. One of the most attractive phenomena related to polaritons is their Bose-Einstein condensation. Thanks to low effective mass inherited from cavity modes, polaritons can exhibit a transition to a massively occupied coherent state above liquid helium temperatures or even at room temperatures for several materials, which is fundamentally inaccessible for atomic condensates. Due to photonic admixture, polariton condensates can be created all-optically, which is their yet another unique feature important for applications. However, due to sufficient radiative losses, polariton condensates are non-equilibrium and can exist exclusively in the optically driven regime. Despite progress in theoretical investigation and emerging applications, the fundamental nature of these driven-dissipative condensates is still under debate and is being actively investigated. The emergent field of *polaritonics* is also pushed forward by several important practical applications. They include quantum information processing schemes, controllable energy transferring, and a vast field of proposals for creating simulators for NP-hard problems.