Bose-Einstein condensation in exciton systems

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Excitons in semiconductors have been considered already for a long time as possible candidates for Bose-Einstein condensation. Due to their light mass compared with atoms, much higher critical temperatures could be expected. Unfortunately, excitons have other properties which may act against condensation: Their finite lifetime does not allow to reach equilibrium at low temperatures, and a strong exciton-exciton repulsion hinders a straightforward condensation, in contrast to what is found in nearly ideal Bose gases. In addition, at high densites, excitons break off into electron-hole pairs (Mott transition).

In the talk, different excitonic systems are discussed in view of condensation: Zero-bandgap semiconductors, polaritons in micro cavities, and dipole-forbidden excitons. Special emphasis is given to spatially indirect excitons in coupled quantum wells. Results of a dynamical T matrix theory are presented which allow to explain new experimental results as blue shift and spectral broadening of the excitonic emission in a lateral trap. The spectral and angular characteristics of the emission are discussed as possible indicator of condensation.