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Dynamic coherent exciton condensates in a semiconductor planar microcavity[1] CHIH-WEI LAI, KYAW ZIN LATT, Michigan State University, YI-SHAN LI, SHENG-DI LIN, National Chiao Tung University — We observed a coherent exciton state with a long decay time ∼1000 ps in a semiconductor planar microcavity structure. The lifetime of cavity polariton condensates previously reported has been limited to ∼10 ps. The sample consists of InGaAs quantum wells positioned near anti-nodes of the photon field in a GaAs λ-cavity sandwiched by GaAs/AlAs-based Bragg mirrors. Under a pulsed excitation above the stop-band of the Bragg mirrors (excess energy >150 meV), spatially coherent exciton emissions were observed to last for ∼1 ns. Conventional dynamic exciton-polariton condensates with a ∼10 ps lifetime were observed under a near-resonant (excess energy ∼ 6 meV) ps pulsed excitation. Dynamics of spatial coherence, energy relaxation, and spin polarization were characterized by time-resolved spectroscopies, including double-slit and polarimetry experiments. The fluctuation of excitonic emissions was characterized by a photon-correlation measurement. The existence of such a long-lived coherent exciton state is attributed to formation of dark excitons under an excitation with significant excessive energy.

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