ATTO-JOULE POLARITON CONDENSATE SWITCH

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Recent progress in polaritonics makes fascinating polariton physics possible at room-temperature [1–3]. Exciton-polaritons obey Bose-statistics and therefore undergo well-known bosonic stimulation in case a state is occupied with N>1 bosons. Exploiting the principle, we have managed driving a strongly coupled organic system towards the regime of dynamic polariton condensation where a transition from incoherent exciton reservoir to a massively occupied polariton state becomes stimulated by a weak resonant seed pulse [4]. We fabricated a strongly coupled microcavity consisting of 35 nm layer of ladder-type conjugated polymer (MeLPPP), sandwiched between SiO_2/Ta_2O_5 DBRs and study dynamic polariton condensation through the direct exciton-to-polariton vibron-mediated relaxation at very low energies of the seed pulse. We observe significant contrast of the ground polariton state occupancy by resonantly seeding the state with a few atto-joules pulse. Figure 1a shows dispersion images recorded for the unseeded (upper) and seeded (bottom) polariton condensates. In particular, seeding of the ground state by 40 aJ pulse drastically changes the total occupancy of the polariton condensate as shown in Figure 1b. Our results reveal extreme nonlinearity of dynamic condensation in Frenkel exciton-polariton systems allowing for microscopic control over macroscopic polariton wave-functions.

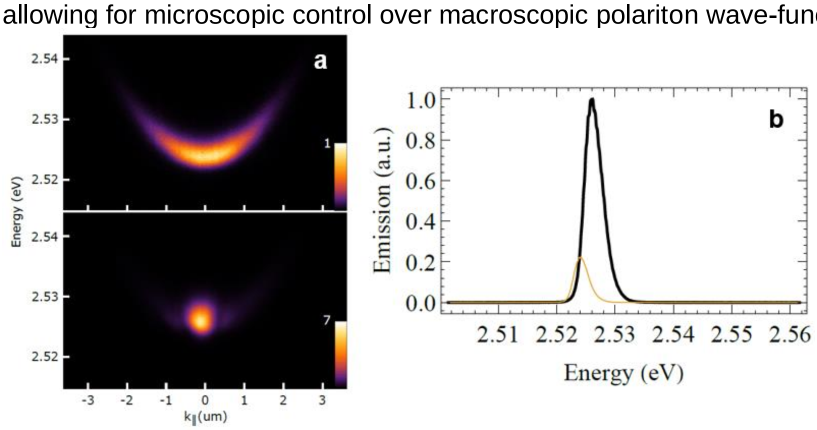

Fig. 1. (a) Dispersion images of unseeded (*upper*) and seeded (*bottom*) polariton condensates. (b) Norm. emission spectra of unseeded (*orange*) and seeded (*black*) condensates integrated over ±0.4 μm^{-1}

References

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