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Actively Tuned and Spatially Trapped Polaritons RYAN BALILI, DAVID SNOKE, Department of Physics and Astronomy, University of Pittsburgh, LOREN PFEIFFER, KENNETH WEST, Bell Labs, Lucent Technologies — The resulting eigenstate of the strong coupling of light and excitons in a two-dimensional semiconductor microcavity produces the quasi-particles called polaritons. Owing to their light mass and bosonic character, these particles are predicted to Bose condense at much higher temperatures and lower densities than their atomic counterparts. However, standard methods of producing strongly coupled semiconductor microcavities are very inefficient. Only tiny regions of the microcavity wafer end up in the strong coupling regime due to the wedge of the layer thicknesses formed during the growth process. Here we present a method to actively control the exciton coupling with cavity photon modes and at the same time create an in-plane spatial trap for polaritons, which is necessary for two-dimensional BEC. The exciton energy of quantum well excitons in a semiconductor microcavity is actively tuned using applied stress. Starting with the quantum well exciton energy higher than the cavity photon mode, stress is used to reduce the exciton energy and bring it into resonance with the photon mode. At the point of zero detuning, line narrowing and strong increase of the photoluminescence are seen. By the same means, an in-plane harmonic potential for the polaritons is created, which allows trapping, potentially making possible BEC of polaritons analogous to trapped atoms. Drift of the polaritons into this trap is also demonstrated.

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