Polarized emission in polariton condensates: Switching in a one-dimensional natural trap versus inversion in two dimensions

We perform polarization resolved spectroscopy of two-and one-dimensional microcavity-polariton condensates, which are formed by exciting the system in the optical parametric oscillator configuration. We observe polarization inversion for linearly polarized pumping parallel to the wire in both the 1D and 2D systems. As the polarization plane of the pump is rotated, the degree of linear polarization of the 2D system oscillates between orthogonal polarizations with the same period as that of the pump. However, the 1D system switches abruptly between two states of high degree of linear polarization with half the period. Two complementary models, based on semiclassical Boltzmann kinetic equations and the Gross-Pitaevskii equation, respectively, obtain an excellent agreement with the experimental results, providing a deep insight into the mechanisms responsible for the polarization switching.