ABS-4 **Crystal Size Effect in Polaritonic Luminescence from Atomic Cryocrystals**

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The exciton-photon interaction leads to the formation of polaritonic states energetically positioned at both sides of the initial exciton. In a large ideal crystal of cubic symmetry, where the interval of the longitudinal-transverse splitting does not contain excitonic levels, the polaritonic dispersion branches lie beyond this interval at both sides of its boundaries. On the contrary, in a crystalline grain comparable or less in size than the wavelength in the substance, the interval of the longitudinal-transverse splitting is filled in continuously by excitonic states intercepting a significant part of the oscillator strength of the excitonic transition. The photoluminescence spectra of atomic cryocrystals (solid Xe and Kr) were measured at the Superlumi experimental station at HASYLAB, DESY, Hamburg. Unlike previous works, where the red polaritonic shift was small commensurably with a weak inelastic polariton-photon scattering, a large polaritonic shift of luminescence is not due to energy dissipation, the energy conservation law being met due to equal probabilities for opposite-sign energy shifts. Such effect is possible if the crystalline grains are comparable in size with light wavelength, which provides the filling in the interval of the longitudinal-transverse splitting by excitons with sufficient oscillator strength. And the sample structure must be perfect enough to lowering the exciton scattering rate with respect to the rate of the polariton formation through exciton-photon coupling. For the first time the excitation spectra of free-exciton luminescence band were recorded simultaneously below the bottom of excitonic band E and within the interval of the longitudinal-transverse splitting. The luminescence of non-equilibrium polaritons was observed

both within the longitudinal-transverse splitting interval and at photoexcitation below E. The excitation spectrum below the bottom of excitonic band is determined by competition of two processes. The first one is the creation of excitons by photons with energy E at the Lorenz tail of excitonic absorption. The second process is a competing absorption related to the direct formation of two-site excitonic polarons (self-trapped excitons). Both excitation spectra of polaritonic luminescence below E and within the longitudinal-transverse splitting interval show high sensitivity to crystal quality of the samples

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