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Effects of Electric-Magnetic Fields on Hybrid Excitons in a Semiconductor Quantum Dot Coated by an Organic Shell QUE HUONG NGUYEN, Marshall University, One John Marshall Drive, Huntington WV 25701
— The effect of electric and magnetic fields on the hybrid exciton of an organic-coated semiconductor spherical quantum dot is considered. Due to dipole-dipole interaction at the semiconductor dot- organic shell interface, a strong mixing of the Wannier-Mott exciton in the quantum dot and the Frenkel exciton of the organic medium occurs, resulting in a new hybrid exciton having priorities of both kinds of excitons as large exciton radius and large oscillator strength. The hybrid excitons are as sensitive to external perturbation as Wannier-Mott excitons. We investigate the effect of mutual presence of electric and magnetic fields on the hybrid exciton of the isolated semiconductor quantum dot such as CdSe (core) clothed by an organic or glass coating for two configuration of fields when the electric and magnetic fields are parallel and orthogonal. The fields affect the eigenfunctions (by a Stark -effect distortion and by the magnetic field-induced distortion) and the Frenkel-Wannier coupling term. Upon the application of the magnetic and electric fields the coupling term between the two kinds of excitons increases. The most important feature of this system is by adjusting the magnetic field and electric field, one can tune the resonance between the two kinds of excitons to get different regions of mixing to obtain the expected high non-linearity.

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