Optical properties of AlGaAs/GaAs resonant Bragg structure at the second quantum state

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Photoluminescence, optical reflectance and electro-reflectance spectroscopies were employed to study an AlGaAs/GaAs multiple-quantum-well based resonant Bragg structure, which was designed to match optical Bragg resonance with the exciton-polariton resonance at the second quantum state in the GaAs quantum wells. The structure with 60 periods of AlGaAs GaAs quantum wells was grown on a semi-insulating substrate by molecular beam epitaxy. Broad and enhanced optical and electro-reflectance features were observed when the Bragg resonance was tuned to the second quantum state of the GaAs quantum well excitons manifesting an enhancement of the light-matter interaction under double-resonance conditions. By applying an alternating electric field, we revealed electro-reflectance features related to the x(e2-hh2) and x(e2-hh1) excitons. The excitonic transition x(e2-hh1), which is prohibited at zero electric field, was allowed by a DC bias due to brake of symmetry and increased overlap of the electron and hole wave functions caused by electric field.

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