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Second quantum state transitions in GaAs/AlGaAs Bragg MQW photonic crystal probed by Optical Reflectance and Electroreflectance YUECHAO CHEN, Z. LIU, M.L. NAKARMI, Department of Physics, Graduate Center and Brooklyn College - CUNY, V.V. CHALDYSHEV, Ioffe Physico-Technical Institute, St. Petersburg, Russia — Electroreflectance spectroscopy measurement provides sharp and derivative-like spectral features in the energy region of excitonic transitions, while suppressing uninteresting background effects due to electro-modulation. We employed both electroreflectance and optical reflectance spectroscopies to probe excitonic transitions in a GaAs/AlGaAs multiple quantum well (MQW) structure. The sample used in this experiment consists of 60 periods of quantum well structures with GaAs well layer (13 nm) and AlGaAs barrier layer (94 nm), grown by solid source molecular beam expitaxy on a semi-insulating GaAs substrate. We performed electroreflectance and optical reflectance measurements by tuning the incident angle to coincide the second state of the heavy hole exciton (e2-hh2) transitions and the Bragg resonance. We observed a significant enhancement of excitonic features at the (e2-hh2) exciton transitions around incident angle of 23 degree in both techniques, revealing the double resonance condition. In the temperature dependent measurement of electroreflectance under the double resonance condition, we observed redshift of the excitonic features with increasing temperature. We will also discuss the effect of polarization in the electroreflectance measurements.

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