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Spin-Dependent Band Structure Spectroscopy in a Strained $Al_{0.1}Ga_{0.9}As/GaAs$ Multiple Quantum Well by Optically Pumped Nuclear Magnetic Resonance[1] RYAN WOOD, CLIFFORD BOWERS, DIPTA SAHA, CHRISTOPHER STANTON, University of Florida, ARNEIL REYES, PHILIP KUHNS, STEPHEN MCGILL, National High Magnetic Field Laboratory, SOPHIA HAYES, Washington University — We present the photon energy dependence of optically pumped NMR (OPNMR) signals in a Si-δ-doped $Al_{0.1}Ga_{0.9}As/GaAs$ multiple quantum well (MQW). Data was acquired at 3.9 T, 4.9 T, and 9.4 T with different polarizations of light. The OPNMR spectra exhibit a strain-induced nuclear quadrupole splitting, caused by differential contraction of the MQW and the Si support to which it is epoxy bonded. The tensile strain in the GaAs quantum well layers, which is estimated from the observed quadrupole splitting, is included in band structure calculations based on the 8-band Pidgeon-Brown model generalized to include the effects of the confinement potential. Our OPNMR photon energy dependence data is compared with calculations of optically pumped electron spin polarization to correlate the OPNMR data with the strained MQW's band structure. Our results demonstrate that the OPNMR photon energy dependence is sensitive to strain-induced light-hole/heavy-hole splitting and quantum confinement effects on the MQW's band structure.

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