Light controlled spin polarization in two dimensional hole gases

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In this work, we have investigated the spin polarization from two dimensional hole gases (2DHG) in p-i-p GaAs/AlAs resonant tunneling diodes under magnetic field parallel to the tunnel current. We have studied the right (σ^+) and left (σ^-) circular polarization of the quantum well (QW) emission and contact layers as a function of the applied bias and laser intensity. We have observed several hole resonant peaks in the current-voltage characteristics curves and assign them to heavy-hole (HH1 and HH2) and light-hole resonances (LH1). The QW emission intensity is very sensitive to applied bias. We have observed that the QW polarization degree exhibits strong oscillations at hole resonances with values up to 46%. These oscillations depend strongly on the light intensity. A sign inversion is observed near the heavy hole resonance (HH2). The emission from contact layers show evidence of a spatially-indirect optical recombination between tunneling electrons and holes confined in *2DHG* at the accumulation layer (*e-2DHG*). The *e-2DHG* emission shows a negative circular polarization. We have observed that the sign of the circular polarization degree of both emissions can be reversed by increasing the light excitation. Finally, the polarization degree of both 2D gases in the accumulation layer and QW are very sensitive to applied voltage and the laser intensity.