Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

State filling dependent tunneling in hybrid InAs/GaAs-InGaAs/GaAs dot-well structures VITALIY DOROGAN, YURIY MAZUR, EUCLYDES MAREGA JR., MOURAD BENAMARA, GEORGIY TARASOV, Department of Physics, University of Arkansas, Fayetteville, AR 72701, USA, CHRISTOPH LIENAU, Institute of Physics, Carl von Ossietzky University, 26129 Oldenburg, Germany, GREGORY SALAMO, Department of Physics, University of Arkansas, Fayetteville, AR 72701, USA — A strong dependence of quantum dot (QD) - quantum well (QW) tunnel coupling on the energy band alignment is established in hybrid InAs/GaAs - $In_xGa_{1-x}As$/GaAs dot-well structures by changing the QW composition to shift the QW energy through the QD wetting layer (WL) energy. Due to this coupling a rapid carrier transport from the QW to the QD excited states takes place. As a result, the QW photoluminescence (PL) completely quenches at low excitation intensities. The threshold intensities for the appearance of the QW PL strongly depend on the relative position of the QW excitonic energy with respect to the WL ground state and the QD ground state energies. These intensities increase by orders of magnitude as the energy of the QW increases to approach that of the WL due to the increased efficiency for carrier tunneling into the WL states as compared to the less dense QD states below the QW energy.

Vitaliy Dorogan
Dept of Physics, University of Arkansas, Fayetteville, AR 72701, USA

Date submitted: 07 Dec 2010 Electronic form version 1.4