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Determination of spin polarization in InAs/GaAs self-assembled quantum dots F. G. G. HERNANDEZ, T. P. MAYER ALEGRE, G. MEDEIROS-RIBEIRO, Laboratorio Nacional de Luz Sincrotron — The electronic spin in a quantum dot (QD) has been proposed as a candidate two-level system for qubit implementation in a quantum information processing scheme (QIP). For semiconductor quantum dots, the optical transition selection rules provide a natural tool for a direct and quantitative measurement of the electronic spin polarization. In contrast to the optical scheme, electrical readout of the electronic spins orientation do not require any knowledge of hole polarization. Here we perform magneto-capacitance measurements of QDs embedded in a Metal-Insulator-Semiconductor (MIS) capacitor structure. A statistical approach for the population of the spin levels allows one to study the spin orientation in the limit of comparable magnetic and thermal energies. The experimental data are analyzed in terms of the addition energies as measured by magneto-capacitance spectroscopy. The amount of polarization was inferred by measuring the addition energies of electrons sequentially loaded in QDs. In this experiment, we found an electron spin polarization higher than 50% for $B_{[001]} = 4$T. Finally, by including the g-tensor anisotropy the angular dependence of spin polarization with the magnetic field B orientation and strength could be explained.

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