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InAs Quantum Dots embedded in GaAs: Properties from Basic Electrical Measurements AZZOUZ SELLAI, Sultan Qaboos University, Physics Department, P.O. Box 36, ABDELMADJID MESLI, IM2NP, UMR 6242 CNRS, Aix-Marseille University, Av. Normandie-Niemen, 13397 Marseille Cedex 20 — C-V and I-V data from a GaAs Schottky diode in which InAs quantum dots (QDs) were embedded are analyzed. The capacitance due to QDs is fitted with an analytical equation that takes into account Gaussian broadening of sub-band levels and contribution of the wetting layer. The voltage range over which the excess capacitance extends is used to estimate the number of charges contained in the QDs. The energy levels of electrons, entirely confined in the QDs, are computed based on a model in which InAs dots are considered of conical shapes and where the effective mass is taken as both position- and energy-dependent. To reconcile the computed energy values with those from the C-V fits, one has to consider a confinement potential other than the potential due to the GaAs/InAs band discontinuity. I-V data could be analyzed using a model that combines field and thermionic emission processes with two distinct behaviors depending on the temperature and bias. Deviations occur at temperatures above 200 K and voltages above 0.4 V. In comparison with the structure with only the wetting layer, the structure with QDs exhibits an excess current in the low-bias forward regime, an indication of contributions from tunneling electrons.

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