World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:9, No:12, 2015

Effect of Wetting Layer on the Energy Spectrum of One-Electron Non-Uniform Quantum Ring

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Abstract : We study the spectral properties of one-electron non-uniform crater-shaped quantum dot whose thickness is increased linearly with different slopes in different radial directions between the central hole and the outer border and which is deposited over thin wetting layer in the presence of the external vertically directed magnetic field. We show that in the adiabatic limit, when the crater thickness is much smaller than its lateral dimension, the one-particle wave functions of the electron confined in such structure in the zero magnetic field case can be found exactly in an analytical form and they can be used subsequently as the base functions in framework of the exact diagonalization method to study the effect of the wetting layer and an external magnetic field applied along of the grown axis on energy levels of one-electron non-uniform quantum dot. It is shown that both the structural non-uniformity and the increase of the thickness of the wetting layer provide a quenching of the Aharonov-Bohm oscillations of the lower energy levels.

Keywords : electronic properties, quantum rings, volcano shaped, wetting layer
Conference Title : ICQD 2015 : International Conference on Quantum Dots
Conference Location : London, United Kingdom
Conference Dates : December 10-11, 2015