Electron in a cubic nanoparticle

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Nowadays, nanomaterials are becoming more and more popular with their various applications. The shape of the nanoparticles seems to have a great impact on their properties and subsequently for the applications it can be used. Many materials can form cubic nanoparticles such as ferrite nanoparticles which can be used in medical, waste water treatment applications etc. Thus, it is of great importance to study these formations.

In the presentation, we are going to examine the cubic nanoparticles under the scope of quantum mechanics. A cubic nanoparticle is like a cubic quantum well with a side of length L , with 0 potential inside the well and infinite outside it. We are going to start with Schrödinger's equation in three dimensions and by using the method of the separation of variables we will solve the equation and find the eigenenergies of the infinite cubic quantum well. Moreover, using the eigenenergies we are going to discuss and calculate the charge-discharge energies and the excitation energy for a cubic nanoparticle.

After that, a way of solving the Schrödinger equation of the finite cubic well will be presented and ways of further improving our approximation of the cubic nanoparticle system will be discussed along with the limitations of our model.

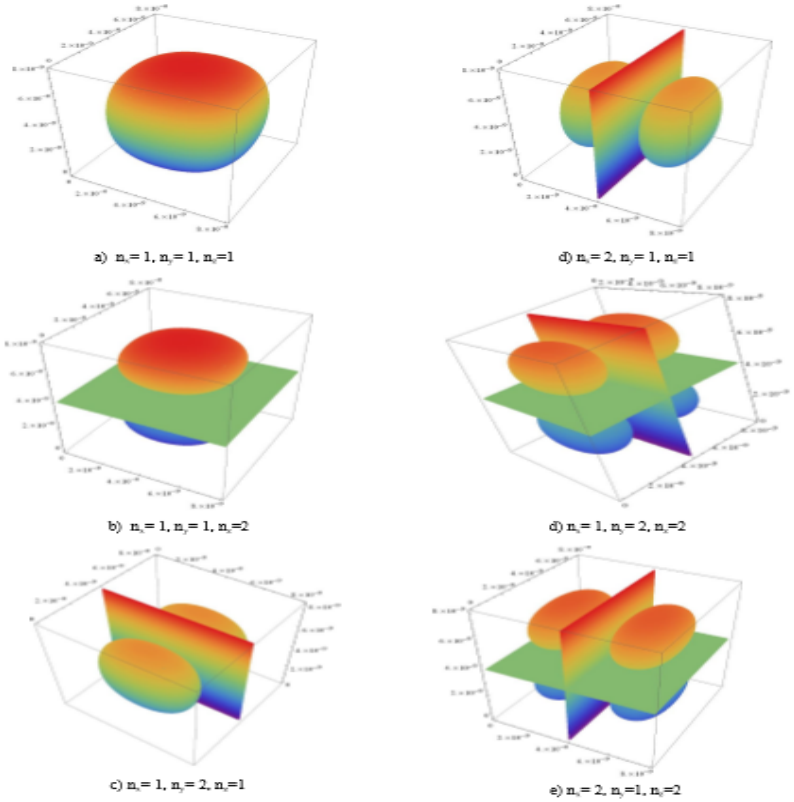

Figure 1: Wavefunction of the six lowest states of the infinite potential barrier quantum cube.[4]

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