SEMINÁRIO DE ANÁLISE

Schrödinger equation in nanotechnology

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Abstract

Nanotechnology is science, engineering, and technology conducted at the nanoscale, which is about 1 to 100 nanometers. It is dominated by quantum physics. In addition, the principle of quantum communication links, quantum computers, and quantum sensors is also related to quantum physics. As known, one of the cornerstones of quantum physics is the Schrödinger equation, which describes what a system of quantum objects such as atoms and subatomic particles will do in the future based on its current state, whose classical analogy is Newton's second law. Therefore solving the Schrödinger equation is essential for development of nanotechnology and quantum information technology. In my talk, first, I am going to make a brief historical review about how the Schrödinger equation is invented. Then I will show how to solve single-particle Schrödinger equation for the new nanomaterials (quantum well, wire, dot, graphene and other 2D materials beyond graphene). After that I will move to the many-particle Schrödinger equation and illustrate how to solve this complicated equation using density functional theory or Hartree-Fock approximation. Specific Challenges of solving this problem will also be presented. Finally, I will discuss about nonlinear Schrödinger equation.