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Title: Entanglement in disordered systems via DFT calculations

Authors: Guilherme Arantes Canella[a] (PG), Vivian Vanessa França Henn[b] (PQ)

Address: Instituto de Química de Araraquara, Universidade Estadual Paulista
[a]guycanella@gmail.com, [b]vvfranca@iq.unesp.br

Abstract: It is well known that spatial inhomogeneities can affect electrical, magnetic, entanglement properties among others. Since entanglement is the key ingredient of quantum information theory, it is of great importance to understand the influence of these inhomogeneities. However, obtaining exact results in strongly correlated systems is a very complex task, even in homogeneous systems, since all particle-particle interactions should be considered. For inhomogeneous systems, this is even worse [1]. The Density Functional Theory (DFT) makes this task easier as it considers the ground-state entanglement as a functional of the density. Moreover, to obtain a good description of the interaction in many-body systems, the one-dimensional Hubbard model can be used. This model has shown interesting results in the understading of entanglement in solids [2–4], mainly when the analytical expression of the functional is known [5]. Most of the studies of the impact of disorder to now has concentrated to repulsive systems. In the present work, we investigate the influence of it on the entanglement properties of systems, which is for example the regime where the model describes BCS superconductivity, Bose-Einstein condensation and exotic superfluidity.

Key-words: Entanglement, disordered systems, Hubbard model, Density Functional Theory

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