# OPTIMIZED WANNIER FUNCTIONS FOR HUBBARD CHAIN WITH VARIABLE-RANGE HOPPING

**Jan Kurzyk[a], Włodzimierz Wójcik[a] Józef Spałek[b]**

[a]Instytut Fizyki Politechniki Krakowskiej, ul. Podchorążych 1, 30-084 Kraków

[b]Instytut Fizyki im. Mariana Smoluchowskiego, Uniwersytet Jagielloński, ul. Reymonta 4, 30-059 Kraków

One-dimensional Hubbard model (Hubbard chain) with a variable-range hopping is described within the extended Hubbard model. The Gutzwiller-ansatz approximation is used to determine the optimized single-particle (Wannier) wave functions in the correlated state. Hopping integral up to the third neighbors is taken into account and the result is compared with those for the infinite-range hopping limit. Ground state energy of the system is calculated with that making use of the rigorous Lieb-Wu solution with the optimized wave functions [1]. The evolution of the properties as a function of interatomic distance is carried out.

[1] J.Kurzyk, J.Spałek, W.Wójcik, Acta Phys. Pol. A, **111**, 603 (2007); arXiv:0706.1266 (2007).

**Subject category :**

1. Strongly Correlated Electrons and High Temperature Superconductivity

**Presentation mode :**

poster

**Corresponding author :**

J.Kurzyk

**Address for correspondence :**

Instytut Fizyki Politechniki Krakowskiej
ul. Podchorążych 1
30-084 Kraków

**Email address :**

pukurzyk@cyf-kr.edu.pl