Phase separations in the narrow band-width limit of the Penson-Kolb-Hubbard model

K.J. Kapcia,[1] W.R. Czart,[2] and S. Robaszkiewicz[2]

[1] *Institute of Physics, Polish Academy of Sciences, al. Lotników 32/46, PL-02668 Warsaw, Poland*

[2] *Faculty of Physics, Adam Mickiewicz University in Poznań, ul. Umultowska 85, PL-61614 Poznań, Poland*

The Penson-Kolb-Hubbard model is one of the conceptually simplest phenomenological models for studying correlations and for description of superconductivity in very narrow-band systems [1,2]. The relevant question is how accurate the standard broken-symmetry Hartree-Fock mean-field approximation is when applied to the on-site term U (for both repulsive and attractive U) [3]. We present phase diagrams and investigate the thermodynamic properties of the model derived within the Hartree-Fock approach in the narrow-bandwidth regime. The results are compared with those exact ones in the atomic limit for the limit of high dimensions. Our investigation of the general case, focussing on phase separated states, shows that results obtained within both approaches are consistent, at least in the low temperature regime.

References:

[1] S. Robaszkiewicz, B. R. Bułka, Phys. Rev. B **59**, 6430 (1999).
[2] K.J. Kapcia, W.R. Czart, A. Ptok, J. Phys. Soc. Jpn. **85**, 044708 (2016).
[3] K.J. Kapcia, W.R. Czart, Acta Phys. Pol. A 130, 617 (2016).