Charge-ordering Instability Driven by Exchange Process of the Long-range Coulomb Interaction

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Charge-ordering (CO) phenomena in organic conductors have attracted great interest in strongly correlated electron system. CO phenomena have been studied theoretically by the Hartree approximation based on an extended Hubbard model with nearest-neighbor Coulomb interaction [1]. These mean-field studies have succeeded in reproducing various charge patterns observed in the charge-ordered phase, while long-range nature of Coulomb interaction beyond the nearest-neighbor molecules has not been studied so far.

In this talk, we study CO phenomena based on the extended Hubbard model with long-range Coulomb interaction derived by the Poisson equation. We note that no charge-ordering occurs in random phase approximation, since the Fourier transformation of the Coulomb interaction are positive for all the wave numbers. Therefore, we first calculate the Green function in the Hartree-Fock approximation, and then calculated the response function according to the recipe of the Baym-Kadanoff conserving approximation (We show the corresponding equation in terms of diagrams in Fig.1). By this approximation, we show that exchange processes expressed by the Fock term induces CO transition. We report obtained finite-temperature phase diagrams, and discuss their relevance to experimental results.

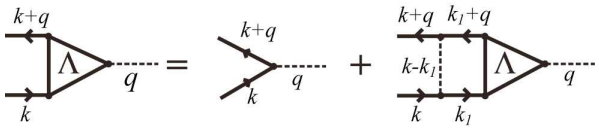

Fig. 1. Diagrammatic representation of the irreducible three-point vertex function corresponds to Hartree-Fock approximation.

[1] H. Seo, J. Phys. Soc. Jpn. 69 (2000) 805