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Fitting of m*/m with Divergence Curve for He_3 Fluid Monolayer using Hole-driven Mott Transition HYUN-TAK KIM, MIT Creative Research Center in ETRI — The electron-electron interaction for strongly correlated systems plays an important role in formation of an energy gap in solid. The breakdown of the energy gap is called the Mott metal-insulator transition (MIT) which is different from the Peierls MIT induced by breakdown of electron-phonon interaction generated by change of a periodic lattice. It has been known that the correlated systems are inhomogeneous. In particular, He_3 fluid monolayer [1] and $La_{1-x}Sr_xTiO_3$ [2] are representative strongly correlated systems. Their doping dependence of the effective mass of carrier in metal, m*/m, indicating the magnitude of correlation (Coulomb interaction) between electrons has a divergence behavior. However, the fitting remains unfitted to be explained by a Mott-transition theory with divergence. In the case of He_3 regarded as the Fermi system with one positive charge (2 electrons + 3 protons), the interaction between He_3 atoms is regarded as the correlation in strongly correlated system. In this presentation, we introduce a Hole-driven MIT with a divergence near the Mott transition [3] and fit the m*/m curve in He_3 [1] and $La_{1-x}Sr_xTiO_3$ systems with the Hole-driven MIT with m*/m=1/(1-ρ^4) where ρ is band filling. Moreover, it is shown that the physical meaning of the effective mass with the divergence is percolation in which m*/m increases with increasing doping concentration, and that the magnitude of m*/m is constant.

[1] Phys. Rev. Lett. 90, 115301 (2003).
[2] Phys. Rev. Lett. 70, 2126 (1993).
[3] Physica C 341-348, 259 (2000); Physica C 460-462, 1076 (2007).

[X] Prefer Oral Session
[ ] Prefer Poster Session

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