Optical properties and quasi-particle behavior in normal state of κ - $(BEDT\text{-}TTF)_2X$ compounds

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Based on a Fermi liquid approach, using the random phase approximation, we have studied the effect of spin fluctuations on the properties of the normal state of κ -$(BEDT\text{-}TTF)_2X$ where the Fermi surface is assumed to depend basically on two parameters namely the bandwidth and the departure from perfect nesting. To probe the spin fluctuations effects on quasi-particles properties in the normal state, we have calculated the spectral function at different points of the Fermi surfaces, the magnetic susceptibility and the conductivity.

We found that, due to nesting properties, quasi-particle weight is reduced near the Fermi level inducing a pseudogap in the density of states which is responsible of abnormal properties in the metallic phase. This pseudogap can explain the conductivity deviation from a Drude behavior and the reduction of the magnetic susceptibility under 100 K.

Our results, which are consistent with NMR, optical experiments and magneto-transport measurements, may explain the anomalous properties of the normal state of κ -$(BEDT\text{-}TTF)_2X$ salts [1-2]. An interesting comparison is made with high critical temperature superconductors.

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[2] D. Meddeb, S. Charfi-Kaddour, M. Héritier, R. Bennaceur, Physica B 404 (2009) 545.