

Novel states close to Mott transition

D.Khomskii

Universitaet zu Koeln, Germany

With increasing bandwidth or decreasing correlations electron systems can go from the localized to itinerant regime (Mott transition). I will discuss this situation and show that close to such crossover several novel states, different both from the standard Mott insulators and from the normal metal, can appear. In particular, electron delocalization can occur not simultaneously in the whole sample, but first in small "clusters" (dimers, trimers), inside which electrons can already be treated as practically delocalized, the whole material still remaining insulating due to weak coupling between such "blocks". Such situation seems to occur e.g. in spinels MgTi_2O_4 , ZnV_2O_4 and in AlV_2O_4 , and also in LiVO_2 . In TiOCl under pressure the localized-itinerant crossover is accompanied by the transition from the spin-Peierls to a conventional Peierls transition. In some cases, especially in systems with orbital degeneracy, close to such crossover there may appear spontaneous charge segregation, examples being e.g. the perovskites CaFeO_3 or RNiO_3 (R - rare earth). It seems that the possibility of occurring of novel states close to Mott transition is a quite ubiquitous phenomenon.