21COE 物質階層融合科学セミナー

物性コロキュウム

日時：１２月7日（火） １６：３０－１８：００
場所: 理学部 総合研究棟７４５号室(大学院講義室Ｉ)
講師： Daniel Khomskii (Universitaet zu Koeln, Germany)
題目：SITE- VS BOND-CENTERED ORDERING, PEIERLS STATE AND FERROELECTRICITY IN OXIDES

Abstract： In studying superstructures in transition metal oxides such as charge or orbital ordering, one usually considers site-centered superstructures. Such are for instance the standard checkerboard charge ordering in $La_{0.5}Ca_{0.5}MnO_3$, or Verwey charge ordering in magnetite. Hovewer there exist another possibility: bond-centered superstructures, such as e.g. the Peierls state in low-dimensional systems. In this talk I will consider the possibility of competition or coexistence of site-centered and bond-centered structures on a few examples. One is the charge ordering in less-than-half-doped manganites. We have recently shown [1] that in this case indeed a bond-centered ordering may exist, and, moreover, bond-centered ordering may coexist with site-centered one, in which case the resulting state would be ferroelectric. This as a rare case of ferroelectricity in magnetic material - the so called multiferroic behaviour.

The second topic is an orbitally-driven Peierls state [2]. I will show that in spinels and in some other frustrated systems a site-centered orbital ordering (ODW-Orbital Density Wave) may lead to the formation of bond-centered singlet Peierls-like states. This picture gives a simple explanation of extremely strange superstructures observed recently in $MgTi_2O_4$ [3] and $CuIr_2S_4$ [4], and may be relevant for several other materials, such as $NaTiO_2$, $La_4Ru_2O_{10}$ [5] and some others. I will also give a general discussion in which cases bond-centered structures may be favourable.

[References]
[1] D.Efremov. J.van den Brink and D.Khomskii, Nature Materials, in press
[2] D.Khomskii and T.Mizokawa, cond-mat/0407458
[3] M.Schmidt et al., Phys.Rev.Lett. 92, 056402 (2004)
[4] P.G.Radaelli et al., Nature 416, 155 (2002)

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☆ 16:15 よりコーヒー、紅茶、お菓子を用意します。カップを持ってお集まり下さい。

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