MAR16-2015-003092

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Spin-orbit dimers in double perovskites

GEORGE JACKELI, University of Stuttgart and Max Planck Institute for Solid State Research, Stuttgart, Germany

In Mott insulators, unquenched orbital degrees of freedom often frustrate the magnetic interactions and lead to a plethora of interesting phases with unusual spin patterns or non-magnetic states without long-range order. Here, we present a theoretical study of interplay of spin and orbital degrees in double-perovskite compounds with d^1 ions occupying the fcc sublattice. We show that the ground state of such a system is non-magnetic dimer pseudo-spin singlet with extensive orientational degeneracy of dimers. We discuss how the pseudo-spin state forming the singlet is altered upon increasing the strength of the relativistic spin-orbit coupling and show that the dimer 'gas' phase remains the ground state throughout. Our theoretical findings support and explain the experimentally observed non-magnetic amorphous valence bond state in Ba_2YMoO_6 and in related compounds.