

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Exchange interaction between J -multiplets NAOYA IWAHARA, LIVIU CHIBOTARU, Theory of Nanomaterials Group, Katholieke Universiteit Leuven — The crystal-field levels in lanthanides and other metal complexes with unquenched orbital momentum originate from the ground atomic J -multiplet. It was long believed that the exchange interaction between J -multiplets is basically described by Heisenberg form, $\mathbf{J}_1 \cdot \mathbf{J}_2$. In this work, Anderson's superexchange model is applied for analytical derivation of exchange interaction between arbitrary \mathbf{J}_1 and \mathbf{J}_2 multiplets [1]. The structure and the energy spectrum of the obtained exchange Hamiltonian are significantly different from those of a Heisenberg Hamiltonian. Besides, it is also found that the $1/U$ approximation [2] is not applicable for the description of exchange spectrum, since it gives qualitatively different predictions compared to the present treatment. Similar results are obtained for the exchange interaction between J -multiplet (\mathbf{J}_1) and isotropic magnetic center (\mathbf{S}_2).

[1] N. Iwahara and L. F. Chibotaru, submitted to Phys. Rev. Lett.

[2] P. Santini, S. Carretta, G. Amoretti, R. Caciuffo, N. Magnani, and G. Lander, Rev. Mod. Phys. **81**, 807, (2009).

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Date submitted: 11 Nov 2014

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