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Ring-exchange interaction in doubly degenerate orbital system with strong electron correlation JOJI NASU, Department of Physics, Tohoku University, SUMIO ISHIHARA COLLABORATION — Orbital degree of freedom is one of the attractive themes in transition-metal oxides. Since the inter-site orbital interaction depends explicitly on the bond direction, one orbital configuration which minimizes the bond energy in one direction does not minimize in other directions. This is a kind of frustration. We study the e_g orbital model (EOM) where the e_g orbital is represented by the pseudo-spin (PS) with nearest neighbor (NN) interaction in a cubic lattice. Due to this frustration, this model shows a macroscopic number of degenerate states in the classical ground states. It is known that these states are lifted by thermal and quantum fluctuations. We examine the long-range interaction effect in the EOM. This interaction is derived by the higher-order perturbational processes of the electron transfer under strong on-site Coulomb repulsion in the two orbital Hubbard model. In particular, roles of the orbital ring-exchange interaction are focused on. This includes the magnetic octupole operator which does not appear in the previous EOM with NN interaction. We analyzed this model by the mean field approximation and the classical Monte-Carlo method. We found that PS canted state is stabilized rather than PS collinear state which is realized in the previous EOM due to thermal and quantum fluctuations. It is also shown that the magnetic octupole polarization appears in a wide parameter region.

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