

# The Lattice Dynamics of pure $LaMnO_3$

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For  $LaMnO_3$  strong coupling of the spin, charge, and orbital degrees of freedom is characteristic. The strong coupling is usually attributed to the strong electron-vibrational coupling due to the Jahn-Teller(JT) effect. That is why lattice dynamics of the pure  $LaMnO_3$  depends on the orbital structure.

We have calculated both the fundamental phonon frequencies of the undoped  $LaMnO_3$  and the phonon frequencies across Brillouin zone. The calculation has been performed in the framework of the interionic pair potentials and shell model [1]. In the pair potential model we explicitly include JT term. As the result of comparison the calculations result with experimental results [2] the most intense Raman lines of  $A_g$  and  $B_{2g}$  symmetry are active in the JT effect. We have calculated the dependence of the Raman active phonons frequencies on JT constant value. According to the results of our calculations there is pronounced change for low frequency of  $B_{3g}$  mode and weak change for frequency of  $A_g$ ,  $B_{1g}$  and  $B_{2g}$  modes. The calculations of the infra red (IR) active phonons, we have performed, shows that LO phonon modes could be observed in experiments. That is why we propose another interpretation of the experimental results [3] on IR experiments. We believe that our calculations could be transferred on other low doped orthorhombic manganites The research described in this paper was made possible in part by Award N REC 005 of the US Civil Research Development Foundation for the Independent States of Former Soviet Union (CRDF) and Ministry of Education of RU N E00-3.4-277

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