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**Calculation of the Order Parameter and the Damping Constant in the Ferroelectric Phase for $NaNO_2$** ALI KIRACI, HUSEYIN KARACALI, Abant Izzet Baysal University, HAMIT YURTSEVEN, Middle East Technical University — The temperature dependence of the order parameter and the damping constant is calculated in the ferroelectric phase in the range of 27 to 162 $^oC$ close to the phase transition ($T_c$=436 K) for $NaNO_2$. The values of the order parameter calculated from the molecular field theory, are used to evaluate the damping constant as a function of temperature on the basis of the soft phonon-hard phonon coupling model for $NaNO_2$ in the ferroelectric phase. By representing the damping constant calculated at various temperatures in terms of an Arrhenius plot, the activation energy is computed for this crystal in the ferroelectric phase. Our calculated order parameter agrees with the measured one and also the damping constant predicts the critical behaviour exhibited by the $NaNO_2$ crystal near the transition temperature in the ferroelectric phase. From the values of the activation energies obtained here, the mechanism of an order-disorder transition which involves the orientation of the $NO_2^-$ ions is investigated for $NaNO_2$.

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