000066

Poster 10

^{23}Na NMR Study in Mixed Crystals $Na_{1-x}Ag_xNO_2$.

J. K. Jung[1], O. H. Han[1*], and S. H. Choh[2]

[1]Magnetic Resonance Group, Korea Basic Science Institute, Taejeon 305-333, Korea

[2] Department of Physics, Korea University, Seoul 136-701, Korea

^{23}Na(I=3/2) NMR study in an isomorphic mixed system, $Na_{1-x}Ag_xNO_2$ (x=0, 0.0084, 0.026, 0.079, 0.094, 0.16), has been carried out as a function of temperature(T) and Ag-impurity concentration(x). The nuclear quadrupole coupling constant(e^2qQ/h) and the spin-lattice relaxation rate($1/T_1$) of ^{23}Na NMR in the pure $NaNO_2$ powder have been obtained by employing the magic angle spinning(MAS) probe and wideline probe, respectively, in the temperature range of 300 - 458 K. The linearity between e^2qQ/h and the squared spontaneous polarization(P_s^2) was obeyed up to near the critical temperature(T_c = 437 K), which is consistent with the previous reports. Moreover, the asymmetry parameter(η) at ^{23}Na site is found to be linear with P_s, firstly noticed in this work. The linearity between $\ln[(1/T_1)_{reo}/(1-P_s^2)(1-P_s)]$ and 1/T is found to be satisfied up to near the T_c, where $(1/T_1)_{reo}$ is the relaxation rate for the reorientational motion of the NO_2^-. From this linearity, the reorientational motion of NO_2^- ion in powder samples is found to have an activation energy, ΔU = (0.22 ± 0.01) eV, which is in good agreement with the value obtained with single crystals.

Ag-impurity effects on the first and second order quadrupole interaction(QI) at ^{23}Na site in an isomorphic mixed system, $Na_{1-x}Ag_xNO_2$, have been investigated by employing ^{23}Na (I=3/2) MAS NMR technique at room temperature. The central transition(CT) and satellite transition(ST) are simultaneously observed with this system. From the spectral analysis, the quadrupole parameter and its distribution width are obtained as a function of Ag concentration. From the intensity loss of CT MAS centerband and of the envelope function of ST MAS sidebands

due to impurities, the range of their influence on the first and second order QI is estimated. The estimated ranges contain the second and first neighbouring Na sites from the resonating ^{23}Na nucleus for the first and second order QI, respectively.