

interpreted as a mixed phase and its spectrum as the superposition of the spectra of two other phases, III and IV. The spectrum of phase V contains modes ($\nu_5(\text{TO})$) and ($\nu_5(\text{LO})$) that correspond to each fundamental mode of phase IV, and, in addition, five lattice phonons (ν_7'' , ν_7' , ν_5'' , ν_5' , and ν_6') which correspond to the spectra of phase III. The superimposed spectra of the parallel ordered NH_4Br IV and the antiparallel ordered NH_4Br III are shown in fig. 4. A mixed phase can be expected in a pseudo-spin system as in NH_4Br where a parallel and an antiparallel oriented phase are already present; examples of mixed phases are well known in magnetic systems [12,13].

4. Summary

Raman studies of the high pressure phase V of NH_4Br and ND_4Br are reported. Deuteration lowers the II-V phase transition pressure from 20 to 9 kbar at 296 K, which is certainly welcome since many more experimental techniques are available at lower pressures. The main features of the results for NH_4Br V, namely (1) the anomalous and strongly temperature-dependent intensity of the Raman peaks, and (2) the small volume-dependent anharmonicity, can be interpreted on the basis of a mixed phase. The two dynamic domains or clusters in phase V are identified as the parallel and antiparallel configurations that one observes in NH_4Br IV and III, respectively, while the new low energy shoulder ($\nu_5''(\text{B}_{2g})$) appearing on $\nu_5(\text{TO})$ at the II-V transition represents the translational motion of the NH_4^+ ions in the *c* direction of the antiparallel configuration. The five lattice modes becoming Raman inactive at the V-IV transition can be assigned to clusters with antiparallel NH_4^+ ions in NH_4Br V. The NH_4^+ ion ordering is an essential feature of the II-V transition although the polarization

of the Br^- ion would be a very important factor in stabilizing the clusters with the antiparallel configuration [14].

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