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NMR studies of nuclear quadrupole interactions in III-V nitride semiconductors

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The III-V nitrides (BN, AlN, GaN, and InN) have attracted much attention in recent years due to their great potential for techonogical applications. In the wurtzite structure, the III-V nitride semiconductors exhibit intrinsic electric feld gradient at the nuclear site due to the hexagonal lattice symmetry. It is well known that the local spin interactions, including the dipolar and quadrupolar interactions, perturb the Zeeman energy levels and directly contribute to the NMR line shape and broadening. In case of quadrupole nuclei, the interaction between the quadrupole moment and the local electric field gradient (EFG) at the nuclear site gives many information of the different bonding configurations on the basis of different symmetries. In this study, we report the quadrupole inteactions of cation nuclei in III-V nitrides by means of solid state NMR experiments and compare experimental results with the caculated one using by the full-potential linearized-augmented-plane wave (LAPW) method.