

^{139}La NQR Study in La_2CuO_4 over Temperatures up to 800 K

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We have measured ^{139}La NQR spectra and the nuclear spin-lattice relaxation rate for the highest ($\pm 7/2 \leftrightarrow \pm 5/2$) and the middle ($\pm 5/2 \leftrightarrow \pm 3/2$) NQR lines in the parent compound of high- T_c superconductor, La_2CuO_4 , in a wide temperature range up to 800 K. From the abrupt increase of the quadrupole frequency ν_Q just below the tetra-ortho structural transition temperature T_{OT} which comes from the staggered tilt of the CuO_6 octahedra, the critical exponent β is evaluated to be 0.4 which is close to 0.5 expected in the standard mean field approximation for second order phase transition. In higher temperature than T_{OT} , the nuclear spin-lattice relaxation at La site is dominated by the quadrupole relaxation, not reflecting the critical spin dynamics in the CuO_2 plane. We successfully discriminate the two types of quadrupole relaxation rate, W_{Q1} and W_{Q2} . The relaxation rate W_{Q2} is one order of magnitude larger than W_{Q1} and increases with the critical exponent $\alpha \sim 1.19$ toward T_{OT} .

Key words: La_2CuO_4 ; NQR; Structural Transition.