

⁷⁵As-NQR study of Superconductivity in LaFeAsO_{1-x}F_x

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The discovery of superconductivity in LaFeAsO_{1-x}F_x at $T_c=26\text{K}$ ¹, followed by that in ReFeAsO_{1-x}F_x (Re: Ce, Pr, Nd, Sm) with T_c as high as 55K ², has attracted much attention. We have performed As-nuclear quadrupole resonance (NQR) measurements on LaFeAsO_{1-x}F_x to elucidate its superconducting gap structure and mechanism of the cooper pair forming.

Here, we report a systematic study by ⁷⁵As nuclear quadrupole resonance in LaFeAsO_{1-x}F_x. The highest $T_c = 27\text{ K}$ is realized for $x = 0.06$ with the strongest antiferromagnetic spin fluctuation (ASF) among the family. Upon increasing doping level from $x = 0.06$, the ASF decreases, and so does T_c . In the optimally doped compound, the spin-lattice relaxation rate ($1/T_1$) below T_c decreases exponentially down to $0.13 T_c$, which unambiguously indicates that the superconducting gaps are fully-opened. The temperature variation of $1/T_1$ below T_c is rendered gradually with increasing x to show a seemingly T^3 behavior for $x = 0.10$ and 0.15 , which can be accounted for by the impurity scattering.

¹Y. Kamihara *et al.*, J. Am. Chem. Soc. **130**, 3296 (2008).

²Z. A. Ren *et al.*, Chin. Phys. Lett. **25**, 2215 (2008).