

Temperature dependent local inhomogeneity and local magnetic moment of (Li_{1-x}Fe_x)OHFeSe superconductor

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(Times New Roman, 12pt, Italic)*

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We have combined extended X-ray absorption fine structure (EXAFS) and X-ray emission spectroscopy (XES) to investigate the local structure and the local iron magnetic moments of (Li_{1-x}Fe_x)OHFeSe ($x \sim 0.2$) superconductors. The local structure, studied by Fe K-edge EXAFS measurements, is found to be inhomogeneous that is characterized by different Fe–Se bond lengths. The inhomogeneous phase exhibits a peculiar temperature dependence with lattice anomalies in the local structural parameters at the critical temperature T_c (36 K) and at the spin density wave (SDW) transition temperature T_N (130 K). Fe K β XES shows iron to be in a low spin state with the local Fe magnetic moment evolving anomalously as a function of temperature. Apart from a quantitative measurement of the local structure of (Li_{1-x}Fe_x)OHFeSe, providing direct evidence of nanoscale inhomogeneity, the results provide further evidence of the vital role that the coupled electronic, lattice and magnetic degrees of freedom play in the iron-based superconductors.

[1] G. Tomassucci et al., Physical Chemistry Chemical Physics, **25**(9), 6684-6692 (2023).