

Magnetic and structural transitions in RFeAsO and its suppression in superconducting RFeAsO_{1-x}F_x (R = Ce, Nd) seen by ⁵⁷Fe local probe

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The discovery of superconducting with a critical temperature exceeding 55 K in the iron-oxypnictides and related compounds has suddenly offered the community a new set of materials, breaking the supremacy of cuprates [1]. Mössbauer spectroscopy have been used to investigate the magnetic and structural phase transition of RFeAsO_{1-x}F_x (R = Ce, Nd). For the non superconducting RFeAsO a magnetic hyperfine field B_{hf} was observed at the ⁵⁷Fe nucleus below $T_N \sim 140K$ and $T_N \sim 145K$ for R = Nd and Ce respectively, indicating the onset of their magnetic transition. The analysis of the low temperature Mössbauer spectra are consistent with a commensurate antiferromagnetic structure with the Fe spins lying in the (a, b) plane for both compounds. A slightly change in the ΔE_Q values around their T_N 's indicate a concomitant structural transition. The magnetic order of Nd and Ce spins (below 2 K and 5 K, respectively) were detected through a transferred B_{hf} at Fe site. On the other hand, no change in ΔE_Q or B_{hf} were observed in superconducting NdFeAsO_{0.88}F_{0.12} and CeFeAsO_{0.84}F_{0.16}. Coexistence of superconductivity and magnetic order has been observed in CeFeAsO_{1-x}F_x series in the region $0.05 \leq x \leq 0.11$.

[1] Y. Kamihara, et al., J. Am. Chem. Soc. 130, 3296 (2008); D. Johrendt and R. Pottgen, Angew. Chem. Int. Ed. 47, 4782 (2008); Z.-A. Ren, et al., Chin. Phys. Lett. 25, 2215 (2008) ; G. F. Chen, et al., Phys. Rev. Lett. 100, 247002 (2008).