Experiment Report

Proposal Code HC-1468

Proposal Title The crystal structure of Mn-substituted SmFeAsO

Beamline ID22

Dates 19 - 21 Nov. 2014

The starting aim of the proposal was to study the structural effect of Mn-substitution on SmFeAsO; with the progress of our work we realized that more spectacular effects are observed in the homologous LaFeAsO. For example only 0.2% of Mn substitution is able to suppress superconductivity in the electron doped LaFeAs($O_{0.89}F_{0.11}$) system, recovering magnetism (Figure 1).

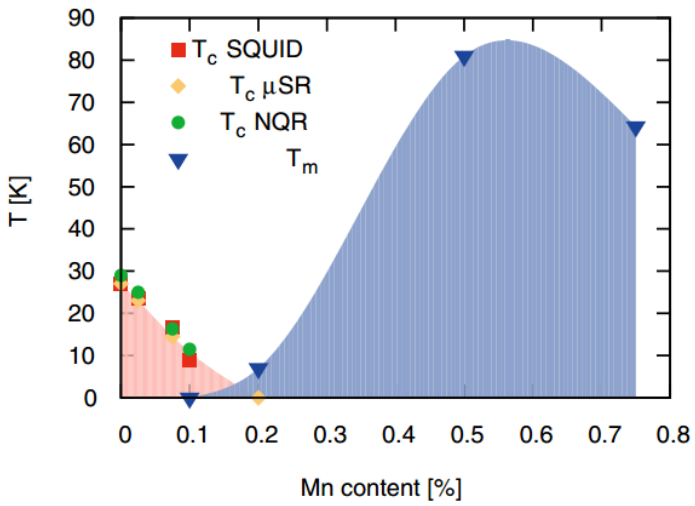

Figure 1: Crossover from a superconducting to a magnetic ground state in the Mn-substituted LaFeAs($O_{0.89}F_{0.11}$) system [form Phys. Rev. B 89 (2014) 134503]

During the experiment at the ID22 beamline of ESRF we succeeded in analyzing two samples of the La($Fe_{1-x}Mn_x$)AsO sample series with x = 0.02 and 0.04 between 10 K and 290 K. The diffraction data were used to carry out structural refinements (Figure 2; on the left); in this way it was possible to determine both the structural evolution with temperature, as well as the structural transition temperature as a function of Mn content (Figure 2; on the right).

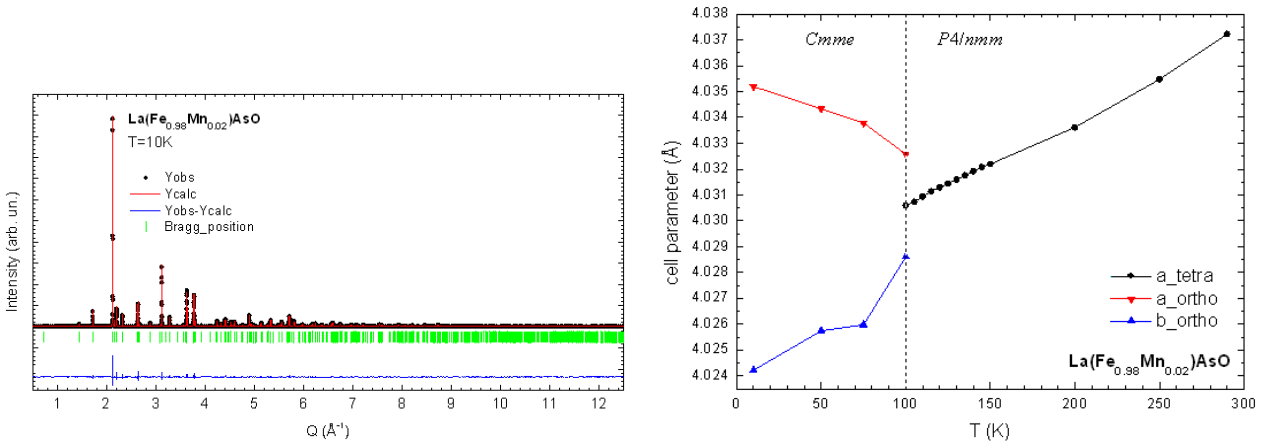

Figure 2: On the left: Rietveld plot obtained using data collected at 10 K from a sample with x=0.02. On the right: Thermal dependence of the cell parameters, marking the structural transition.