ESRF	**Experiment title:** Slow diffusion of Fe in $L1_0$-FePd measured by nuclear reflectivity	**Experiment number**: HS 3170
Beamline: ID18	**Date of experiment**: from: 13.09.2006 to: 26.09.2006	**Date of report**:
Shifts: 15	**Local contact(s)**: Dr. Rudolf Rüffer	*Received at ESRF:*

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Report:

The results from our experiment on FePt "Self-diffusion of iron in $L1_0$-ordered FePt thin films**"** have been published under:
M. Rennhofer, B. Sepiol, M. Sladecek, D. Kmiec, S. Stankov, G. Vogl, M. Kozlowski, R.Kozubski, A. Vantomme, J. Meersschaut, R. Rüffer, and A. Gupta,
Phys. Rev. B**74**, 104301 (2006).

We enclose the abstract of this publication:
Diffusion of iron atoms in a thin FePt film of $L1_0$ structure was investigated in the low temperature region where iron diffusivities are between 10^{-22} m^2 s^{-1} and 10^{-24} m^2 s^{-1}. A new method using nuclear resonant scattering of synchrotron radiation in grazing incidence geometry was used, providing higher accuracy and sensitivity than the conventional tracer methods.
Isotopical FePt multilayer samples Pt(20 Å)/[^{57}FePt(20 Å)/FePt(30Å)]$_{10}$/MgO(001) produced by molecular beam epitaxy were annealed at four temperatures between 773 and 873 K for times between 60 and 120 min. The nuclear reflectivity was measured at room temperature after each annealing step and the decrease of the nuclear superstructure Bragg-peak intensities was observed. From the intensity loss (see Fig. 1), the diffusion coefficient and the

activation energy for iron self-diffusion in the FePt thin film along the *c* axis were determined as
D_0= (3.45±0.44)×10^{-13} m^2 s^{-1} and Q = (1.65±0.29) eV. The value for the activation energy is the same as found by residual resistivity measurements in the same system.

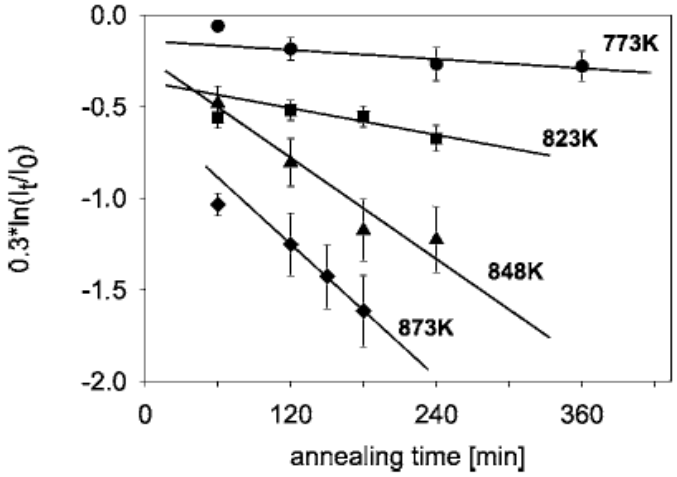

Fig. 1. Logarithmic ratio ln(I_t/I_0) of the Bragg-peak intensities versus the total annealing time at 773, 823, 848 and 873 K. The lines are linear regressions. The slopes correspond to the diffusion coefficients.