ESRF	**Experiment title:** Temperature dependent Magnetic EXAFS at Gd L-edges in Gd metal and in GdZn intermetallic compound	**Experiment number**: HE-536
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Report:

Following the suggestion of the of the review committee we carried out the temperature dependent magnetic EXAFS (MEXAFS) experiments at a Gd single crystal first. The data were taken at four temperatures (10K, 100K, 200K and 250K) at the L_3, L_2, and L_1-absorption edges using the gap-scanning as well as the fixed-gap setup of the beamline. As the gap-scanning technique worked very satisfactorily the detailed investigations were carried out with a moving gap to keep the degree of polarization constant for the full photon energy range of ΔE=1200eV. Using this setup we were able to record MEXAFS data of high quality as shown in Fig. 1 for the Gd L_3-edge (for the sake of a better comparison, the data for 200K are not presented in this figure). The MEXAFS oscillations $\chi_M(k)$ can be detected up to a photoelectron wavenumber of k=13.0$Å^{-1}$. A clear temperature dependent damping can be seen. One origin of this damping is the reduction of the magnetization as T=250K corresponds to a reduced temperature of $T/T_c \approx 0.85$. The reduction of the magnetization will lead to a simple scaling of the MEXAFS oscillation by a factor. But there is an additional type of damping which is Debye-Waller factor like ($e^{-2\sigma^2 k^2}$) and hence leads to an exponential damping in the magnetic EXAFS. This can be seen from the fact that the MEXAFS oscillations at 250K are only reduced by to 50% of the 10K data in the low k-range (k=2.5$Å^{-1}$ to k=9.0$Å^{-1}$) whereas the oscillations are nearly completely damped for the higher k-values starting from k=9.0$Å^{-1}$. This clearly indicates that lattice vibrations of the spin dependent scattering potential lead to an additional reduction of the MEXAFS signal as it is also found for the regular EXAFS in our experiment. By comparison to theoretical calculations the single-scattering contributions will be separated from multiple-scattering contributions for the normal EXAFS and the magnetic EXAFS signal. Therefore the temperature dependence of the individual scattering paths will be analyzed. This separation will be carried out in the R-space. The Fourier transform of the MEXAFS oscillations is given in Fig. 2. Also in this figure a clear temperature dependence is found.

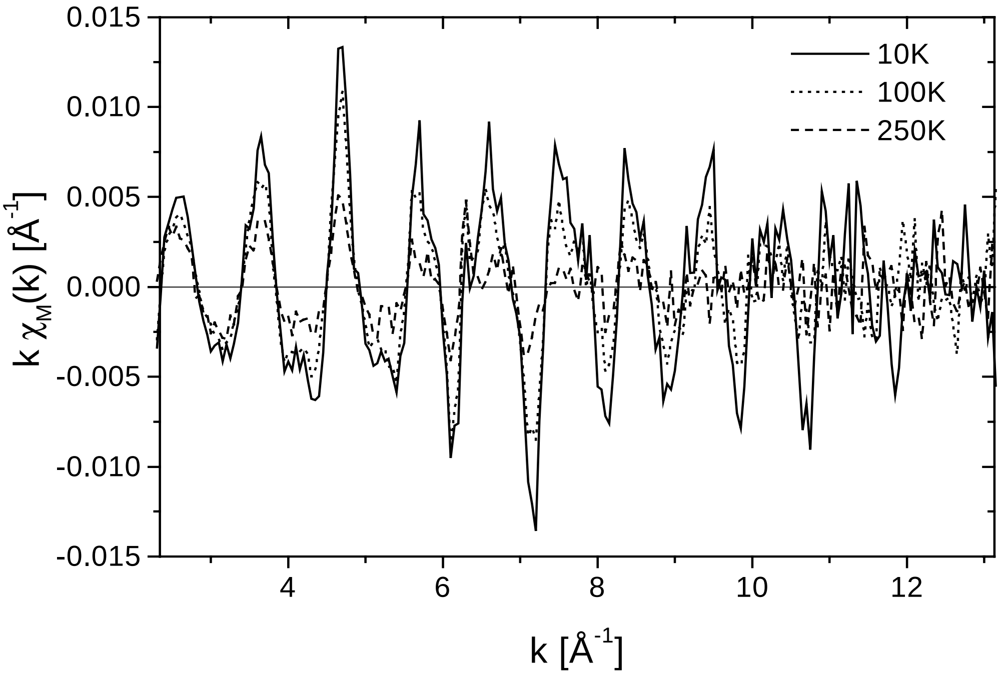

Fig.1: Temperature dependent MEXAFS oscillations k $\chi_M(k)$ for a Gd single crystal at the L_3 absorption edge as a function of the photoelectron wavenumber

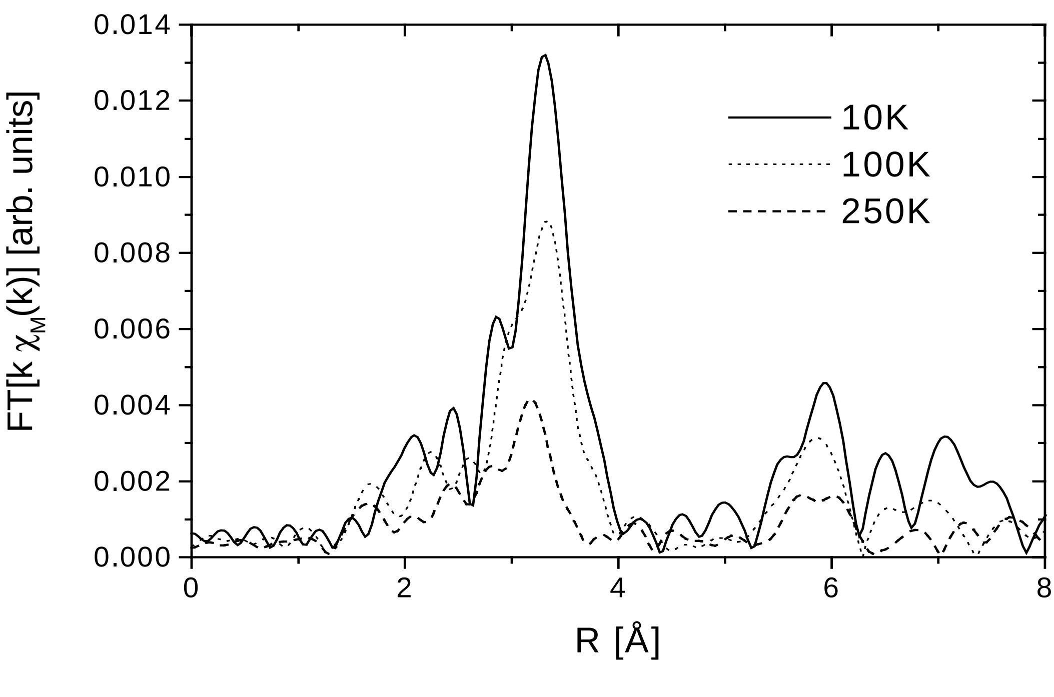

Fig. 2: Fourier transform FT[k $\chi_M(k)$] of the MEXAFS oscillations given in Fig. 1.