



	Experiment title: Magnetism of the Cr sublattice in RCr_2Si_2C , $R = Pr, Nd$	Experiment number: HE-3674
Beamline: ID12	Date of experiment: from: 7.9.2011 to: 11.9.2011	Date of report: 7.1.2012
Shifts: 12	Local contact(s): Fabrice Wilhelm	<i>Received at ESRF:</i>
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Report:

Recently described RCr_2Si_2C compounds ($R =$ rare-earth element), crystallizing in the tetragonal $CeMg_2Si_2$ -type structure [1, 2, 3], are the C-stabilized structure variants of the RCr_2Si_2 compounds. It has been shown that in RCr_2Si_2 compounds ($R = Tb, Ho, Er$) the Cr ions bear stable magnetic moments which order antiferromagnetically at temperatures lower than 700 K [4]. In the case of RCr_2Si_2C compounds, the first-principles electronic structure calculations based on the density functional theory (DFT) provided ordered magnetic moment on the Cr site which amounts about 0.5 and 0.7 μ_B for $LaCr_2Si_2C$ and $PrCr_2Si_2C$, respectively [2].

We have studied $PrCr_2Si_2C$ and $NdCr_2Si_2C$ single crystals by means of X-ray magnetic circular dichroism (XMCD) using the beamline ID12. We have measured the XMCD at the rare-earth $L_{2,3}$ -edges and at the Cr K -edge at 2.25 K and in $B = 3T$. For $PrCr_2Si_2C$, the measured XANES and XMCD spectra for Pr $L_{2,3}$ -edges and Cr K -edge are presented in Fig. 1 and Fig. 2. Then we have recorded element-specific magnetization curves at those edges. The results obtained for Pr L_2 -edge and Cr K -edge in $PrCr_2Si_2C$ are presented in Fig. 3 and Fig. 4.

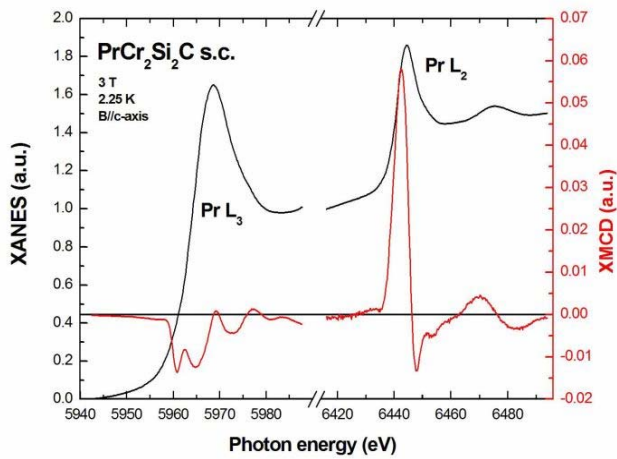


Fig. 1: XANES and XMCD spectra measured at the Pr L_2 - and L_3 -edge in $\text{PrCr}_2\text{Si}_2\text{C}$.

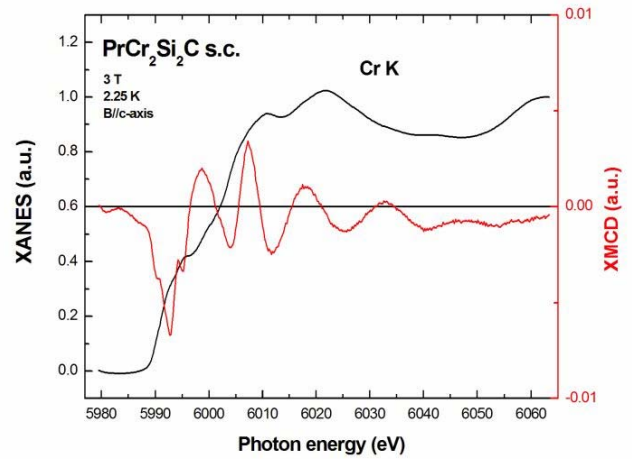


Fig. 2: XANES and XMCD spectra measured at the Cr K-edge in $\text{PrCr}_2\text{Si}_2\text{C}$.

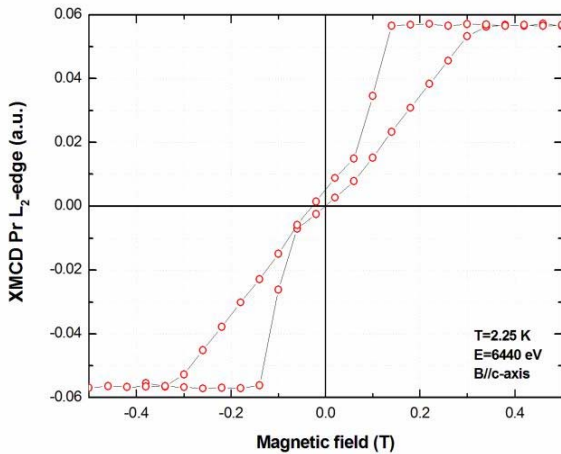


Fig. 3: Magnetization curve measured at the Pr L_2 -edge in $\text{PrCr}_2\text{Si}_2\text{C}$.

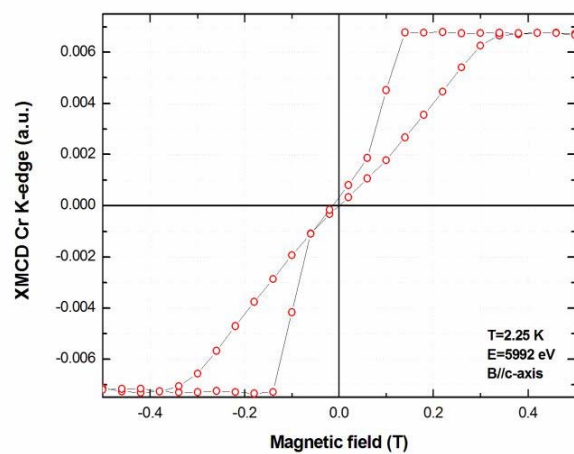


Fig. 4: Magnetization curve measured at the Cr K-edge in $\text{PrCr}_2\text{Si}_2\text{C}$.

The first look at the measured data shows us that the Cr sublattice is magnetically coupled with the rare-earth one. Further analysis concerning the contribution due to Cr itself and due to the presence of the rare-earth atoms is still in progress.

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