ESRF	**Experiment title:** Circular magnetic dichroism on uranium M edges in UFe_2 and UNi_2 Laves phases	**Experiment number:** HC539
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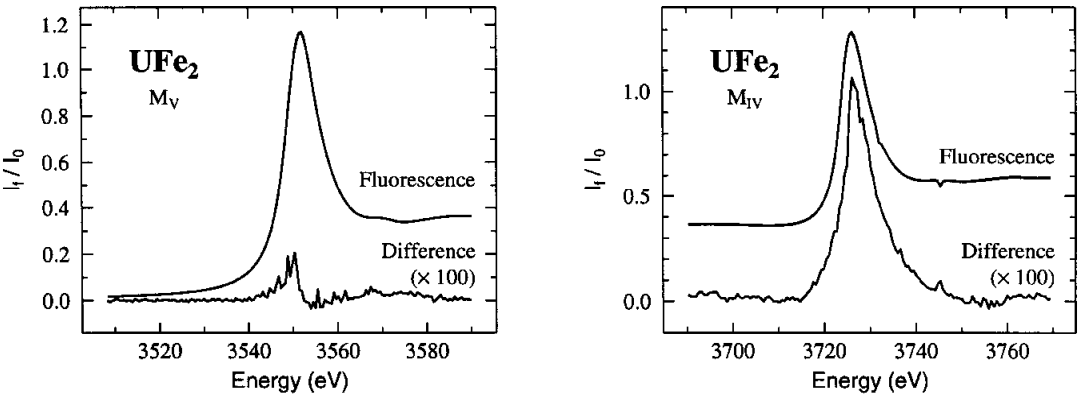
Report:

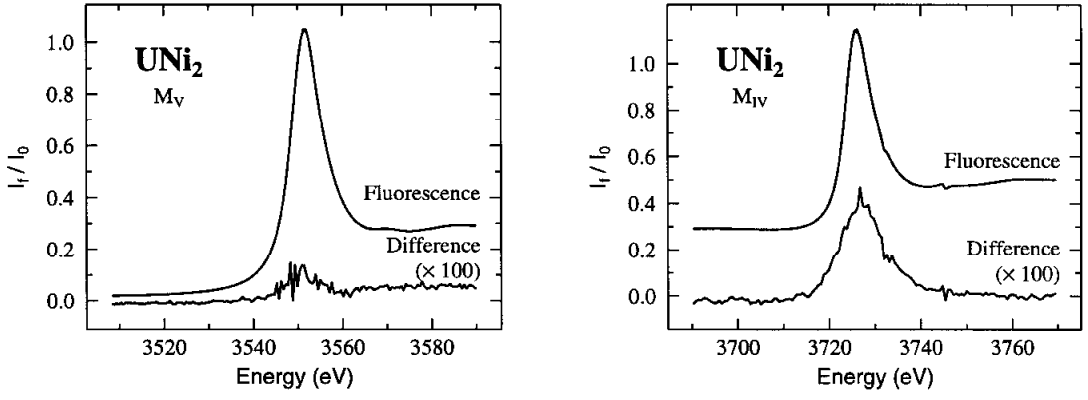
In recent years, the study of actinide compounds have attracted much interest because of the variety of properties these materials can have at low temperatures (e.g. heavy fermion behaviour coexisting with non conventional superconductivity). For light actinides (5f shell less than half filled) one may anticipate that the orbital moment, if it exists, should be opposite in sign to the spin moment (third Hund's rule). This gives rise to the possibility of having a cancellation of the spin and orbital moments. Therefore materials can exist without a net total moment but with finite spin and orbital moments. Polarized neutron scattering experiments have shown that the Laves phases UFe_2 and UNi_2 intermetallics are such compounds [l]. We have attempted to measure the orbital and spin magnetic moments of the uranium 5f electrons by the X-ray Magnetic Circular Dichroism (XMCD) technique. The measurements have been done at the Mv and M_{IV} edges located at 3.55 keV and 3.73 keV. The signal was detected in fluorescence mode.

In Figs. 1 we present the fluorescence spectrum I+ and the dichroic asymmetry for the two uranium edges in UFe_2. In Figs. 2 the same quantities are presented for UNi_2. In Figs. 3 are shown the absorption spectrum γ_+ and the dichroic asymmetry of the absorption for UFe_2. The absorption spectra have been computed from the fluorescence spectra taking into account the self-absorption effects. The dichroic asymmetries of the absorption are normalized to 100 % circular polarization rate. We note that the absorption and the fluorescence spectra differ substantially. From the analysis we deduce the orbital and spin magnetic moments of the $5f$ electrons. We find $\mu^U_{L(5f)}$ = 0.21 μ_B and $\mu^U_{S(5f)}$ = -0.20 μ_B. As expected they are antiparallel. The work on UFe_2 is described in a report to be published in Phys. Rev. B.

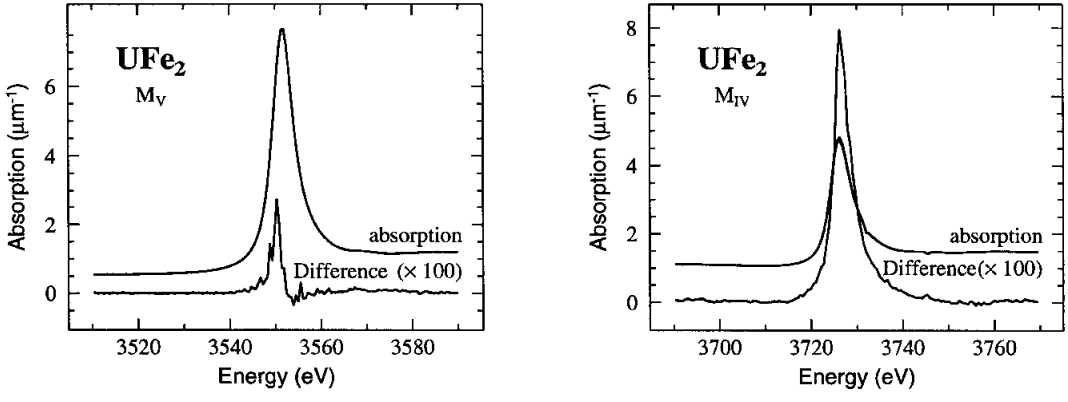
[l] M. Wulff et al., Phys. Rev. B 39, 4719 (1989).



Figures 1 : Fluorescence *spectrum* I+ *and* dichroic asymmetry *spectrum* AI (AI = *I+ - I-) measured at the* $M_{IV,V}$ *edges of* uranium in UFe_2. *The* intensity of the field was 2 T and *the* temperature *20 K. The* index *+ (−) specifies that the field is parallel (antiparallel) to the X-ray helicity.*



Figures 2 : *same caption as for Figs. 2 but for* UNi_2. *The data were recorded at 10 K.*



Figures *3 : absorption spectrum* γ_+ and dichroism $\Delta\gamma\,(\Delta\gamma = \gamma_+ - \gamma_-)$ measured at *the* $M_{IV,V}$ *edges of uranium* in UFe_2. *The data have been corrected for the energy dependence of the* circular *polarization* rate of the monochromatic beam.