Recent Results in Neutron Scattering Experiments

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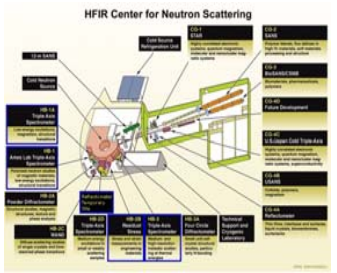
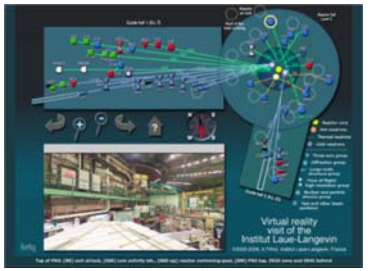
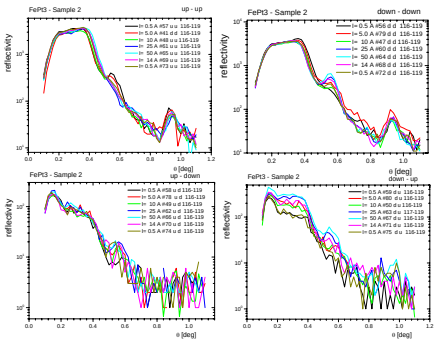




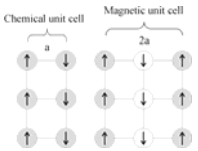
We have ongoing experiments at the High Flux Isotope Reactor Facility in Oak Ridge National Laboratory and The Institut Laue-Langevin in Grenoble, France and the FRG-1 Research Reactor in the GKSS Forschungszentrum. For more information of the experimental facilities see: http://neutrons.ornl.gov/hfir_cns/instruments.htm, http://www.ill.fr/pages/Virtual_visit/index.html and http://www.gkss.de.

Polarized Neutron Reflectivity of $FePt_3/CoPt_3$ Bilayer Films



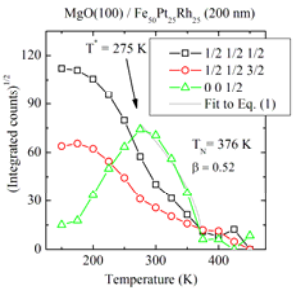
•Results from a recent experiment on ADAM at ILL.
•Only neutrons can resolve the difference in scattering contrast between $FePt_3$ and $CoPt_3$.
•In addition to chemical contrast, some reflection peaks provide magnetic information.
•The strong magnetic field dependence of the peak at 0.5 deg indicates that the magnetic structure is changing with applied magnetic field.

Neutron Diffraction of Antiferromagnetic Spin Ordering Phases

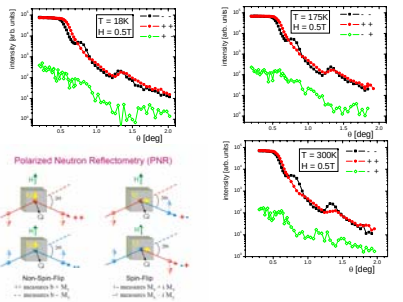


(100) (½ 0 0)

Period doubling in real space produces half order diffraction spots in reciprocal space.

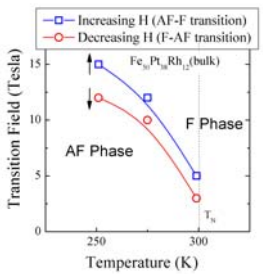


•The 2π/a (0 0 ½) antiferromagnetic Bragg peak for the $Fe_{50}Pt_{25}Rh_{25}$ film showed a maximum at 275 K and corresponds to a measured anomaly in the bulk magnetic susceptibility.
•This measurement shows that antiferromagnetic ordering can be complex and can exhibit phase transitions while the material remains an antiferromagnet.



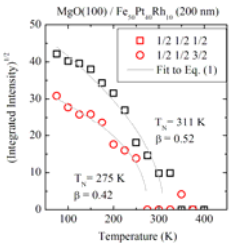
•Results from an experiment performed at the FRG-1 in the GKSS Laboratory at Hamburg, Germany
•The temperature dependence reveals the effect of the antiferromagnetic component on the magnetic structure.
•First peak of SL structure shows splitting of non-spin-flip intensities for all temperatures
•Second peak of SL exhibits just significant splitting above Néel transition temperature of $FePt_3$.

Exchange-Inversion

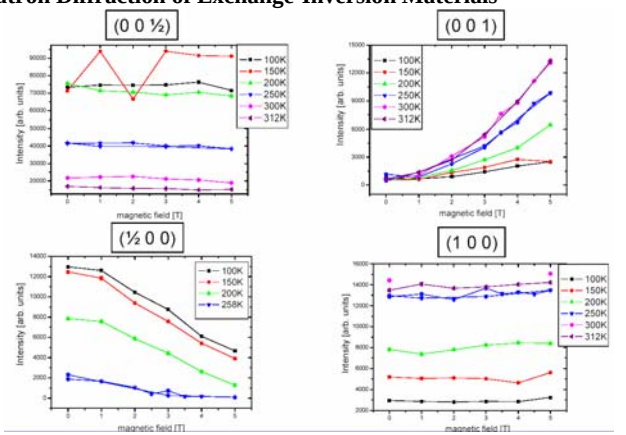


•At particular values of composition and temperature, FePtRh alloys can transform from antiferromagnetic phases to ferromagnetic phases.
•We are applying neutron diffraction to probe the detailed magnetic structure of these alloys as functions of composition, temperature and field.
•The magnetic structures are complex, and the ordering is anisotropic.

Unpolarized Neutron Diffraction of Exchange-Inversion Materials



•Results from HFIR show the temperature dependence of the antiferromagnetic Bragg peaks of the exchange-inversion composition.
•Magnetometry showed a ferromagnetic phase for this material above room temperature.



•Results from INI2 at ILL.
•Can we change the magnetic structure of the exchange-inversion material, $Fe_{50}Pt_{40}R_{10}$, with applied magnetic field?
•No significant change in (0 0 ½) AF peak.
•(½ 0 0) intensity is clearly reduced by application of magnetic field □ reordering
• Peak at (0 0 1) position appears with magnetic field and increases, stronger with temperature □ ferromagnetic contribution.
• (1 0 0) always present with temperature and magnetic field, no change with magnetic field. Polarized measurements show that this peak is ferromagnetic (shows only spin flip)

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