Tuesday Afternoon, October 16, 2007

Understanding Biointerphases and Magnetism with Neutrons Topical Conference

Room: 618 - Session NT-TuA

Magnetism

Moderator: M. Grunze, University of Heidelberg, Germany

2:00pm **NT-TuA2 Introduction to Magnetic Neutron Scattering**, ***S.E. Nagler***, Oak Ridge National Laboratory **INVITED**

Neutron scattering is arguably the most powerful experimental technique available for characterizing magnetic structures and excitations. This talk will provide a brief introduction to neutron scattering, with emphasis on its application to problems in magnetism. The talk is intended for scientifically literate non-specialists.

2:40pm **NT-TuA4 Polarized Neutron Reflectometry and Diffraction on Magnetic Thin Film Structures**, ***F.R. Klose***, Oak Ridge National Laboratory **INVITED**

In this presentation, I will review applications of polarized neutron reflectivity and diffraction in regard to magnetic thin film research. Polarized reflectivity is an ideal tool for investigating vector magnetization profiles in thin film systems with a vertical depth-resolution of a few monolayers. The method has been used for many years, for example, to demonstrate oscillatory exchange coupling in magnetic multilayers, the effect which is causing giant magneto-resistance. Recently developed polarized "off-specular / diffuse" scattering methods also allow investigations of lateral (in-plane) magnetic correlations on length-scales between 1 nm and 100 µm. High-angle magnetic neutron diffraction is an extremely powerful technique for investigating atomic-scale antiferromagnetism in thin films. The latter is very important in regard to the exchange bias effect which is used in magnetic storage technology. Recent research results on Fe-Pt based films for magnetic recording applications will be presented.

4:00pm **NT-TuA8 Opportunities for Neutron Scattering in Thin Magnetic Films for Sensor Technology.**, ***M.L. Plumer***, Memorial University of Newfoundland, Canada **INVITED**

With the continued demand for ever smaller and faster magnetic sensors based on thin-film technology the requirements for deeper understanding of the relevant processes involved continue to grow. Simple modeling methods based on Maxwell's equations, and simple experimental techniques that measure only bulk magnetic properties, served the industry well for the latter part of the twentieth century but are no longer adequate research tools for the engineering of the nanometer magnetic devices of today and tomorrow. This talk will review some of the detailed knowledge of both static and time-dependent behavior of interacting magnetic grains within films and multilayers that can be gained through micromagnetic simulations based on the Landau-Lifshitz-Gilbert (LLG) equations. Opportunities for the use of a variety neutron scattering techniques to measure such detailed equilibrium and dynamic properties will be discussed.

4:40pm **NT-TuA10 Nanostructures and Ordering Phenomena in Magnetic Colloids Probed by Small Angle Neutron Scattering**, ***A. Wiedenmann***, Hahn-Meitner-Institut Berlin, Germany **INVITED**

Small Angle Neutron Scattering (SANS) allows fluctuations of density, composition and magnetization to be analysed simultaneously on a nanometers length scale. This non-destructive technique was used to characterise magnetic colloids which are of growing interest for advanced medical applications. Such "Ferrofluids" consist of nanosized magnetic particles coated by nonmagnetic organic surfactants and dispersed in carrier liquids. Isotope contrast variation combined with the newly developed technique of polarised neutrons ("SANSPOL") allowed size distributions, compositions and magnetic moments of magnetic core-shell particles and magnetic aggregates to be evaluated precisely beside non-magnetic micelles of similar sizes.[1] In concentrated Ferrofluids an unconventional pseudo-crystalline ordering has been monitored by SANS resulting from strong field-induced inter-particle correlations.[2-3] New stroboscopic techniques have been developed which allowed the dynamics of ordering and realxation to be studied in a time range similar to that of X-ray photon-correlation spectroscopy.[4]

[1]Wiedenmann, A., Kammel, M., Heinemann, A., Keiderling, U. J. Phys. : Condensed Matter: 18 (2006) S2713-2736

[2]Wiedenmann, A., Hoell, A., Kammel, M. , Boesecke, P. Phys Rev. E 68 (2003) 031203

[3]Klokkenburg, M., Erné, B. H., Meeldijk, J.D., Wiedenmann, A., Pethukov, A.V., Philipse, A.P, Physical Revue Letters 97, 185702 (2006)

[4]Wiedenmann, A., Keiderling, U., Habicht, K., Russina, M., Gähler, R., Physical Review Letters 97, 057202 (2006)

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