

Title: Novel Spintronic Materials Investigated with Polarised Neutrons

Speaker:

Dr. Frank Klose

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Date: Friday, 16 September 2011

Time: 11:15 am

Venue: Room 603, Chow Yei Ching Building

Abstract:

Artificial multilayer structures have formed the mainstay of modern day magnetism as completely novel magnetic properties may be fabricated, many of which are crucial to numerous spin-electronics applications. In this talk, I will present magnetic characterisations of two different nanoscale artificial multilayer systems. In both cases, spin-resolved neutron reflectivity [1] turned out to be the key experimental technique for obtaining depth-resolved magnetic characteristics, in particular related to the lateral arrangement of the magnetic moments.

In the first study, we present a new approach of creating a ferromagnetic (FM) / antiferromagnetic (AFM) modulated structure, without changing materials composition, stoichiometry or lattice structure, namely by artificially controlling the degree of chemical order in the FePt₃ thin films [2].

In the second part of this talk, we report on a unique change of the interlayer coupling of Co/Cu multilayers as the non-magnetic spacer layer Cu is substituted by Cu₉₄Mn₆ resulting in a temperature-dependent canted “biquadratic” coupling of neighbouring Co layers. We present a theoretical model based on the “loose spin” theory and compare this to our experimental results [3].

[1] Characterization of Magnetic Materials by Means of Neutron Scattering;

G. Ehlers and F. Klose

in Handbook of Advanced Magnetic Materials, Vol. 2, Characterization and

Simulation,

Liu, Yi; Sellmyer, D.J.; Shindo, Daisuke (Eds.) Springer (2006), pages 66 – 112.

[2] Artificially modulated chemical order in thin films: A different approach to create ferro/antiferromagnetic interfaces

T. Saerbeck, F. Klose, D. Lott, G.J. Mankey, Z. Lu, P.R. LeClair, W. Schmidt, A. Stampfl, S. Danilkin, M. Yethiraj, A. Schreyer,
Physical Review B 82 (2010) 134409.

[3] T. Saerbeck, N. Loh, D. Lott, B. P. Toperverg, A. M. Mulders, A. Fraile Rodríguez, J. W. Freeland, M. Ali, B. J. Hickey, A. P. J. Stampfl, F. Klose, and R. L. Stamps
Spatial Fluctuations of Loose Spin Coupling in CuMn/Co Multilayers,
Phys. Rev. Lett. 107, 127201 (2011)

Biography of the speaker:

Dr. Frank Klose completed his doctorate in experimental physics at the University of Goettingen, Germany. The main theme of his thesis was synchrotron absorption spectroscopy on magnetic thin films. During his postdoctoral years, he joined the Hahn Meitner Institute in Berlin, Germany as an instrument scientist for neutron reflectometry and later the Argonne National Laboratory in Chicago. In 1997, he was appointed as a professor of technical physics in Dresden, Germany. In 1999, Dr. Klose joined the Spallation Neutron Source at the Oak Ridge National Laboratory, USA where he served as senior scientist and group leader for large scale structures science.

In 2007, Dr. Klose joined the Australian Nuclear Science and Technology Organisation in Sydney, Australia, where he is now leading the neutron beam instruments and major capital projects group at the Bragg Institute. His group of ~40 scientists, engineers, technicians and administrative staff is responsible for delivering seven new neutron instruments and several other major instrumentation projects over the coming years with a budget of \$60 M. He is also a professorial fellow of the University of New South Wales, Sydney, and his science group is working on novel spintronic materials.

Organizer: Dr. P.W.T. Pong