TECHNISCHE UNIVERSITÄT WIEN

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IAP-SEMINAR

ANNOUNCEMENT

Date: **Tuesday, 24.1.2017**
Time: **16:00 s.t.**
Location: **Technische Universität Wien, Institut für Angewandte Physik, E134**
yellow tower „B“, 5th floor, Sem.R. DB gelb 05 B (room DB05L03), 1040 Wien, Wiedner Hauptstr. 8-10

Lecturer: **Hans J. Hug**
Empa, Swiss Federal Laboratories for Materials Science and Technology, Dübendorf/Switzerland

Subject: **Local Dzyaloshinskii-Moriya Interaction in Skyrmion Thin-Film Multilayers Measured**

Abstract: To understand and control skyrmions in spintronics applications will require quantitative magnetic measurements of their structure at nanometer scales and at RT, from substrate-based thin films with oxidation protection layers. We show how magnetic force microscopy techniques can achieve this.
The Dzyaloshinskii-Moriya interaction (DMI) induced by the interfaces of thin-film structures supports skyrmions at room temperature [1]. The local and average DMI can be quantified from measured domain patterns, because the DMI coefficient D results from an equilibration of magnetostatic and wall energies. Local D values are obtained from matching simulated MFM profiles from skyrmions to measured MFM data. We use calibrated MFM tip transfer functions to calculate the MFM frequency shift profiles from model skyrmion magnetization distributions. We show skyrmions smaller than previously observed in similar materials, are not circularly symmetric and pinned to 50 nm wide areas of 75% higher than average DMI. This finding matches our measurement of Co layer thickness inhomogeneity of the order of ±1.2 atomic MLs per 0.6 nm layer. Thus layer flatness must be controlled with greater precision to preclude skyrmion pinning.

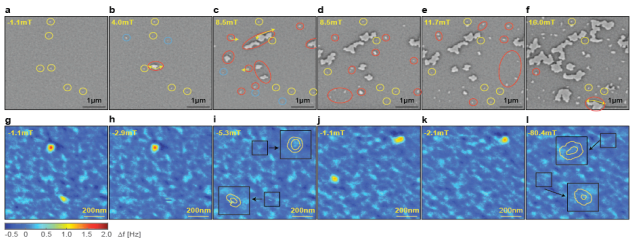

Figure 1: **a**-**f** Sequence of images of a same area of sample A in increasing applied fields following negative saturation. **g**-**i** High resolution image sequence of a one area of sample A containing two skyrmions up to saturation (**i**). The inset panels zoom in (2x) onto the position of the skyrmions (150nm x 150nm) in relation to the background at saturation. **i**-**l** Second set of high resolution images.

[1] C. Moreau-Luchaire, et al., Nature Nanotech. 11, 444-448 (2016).

All interested colleagues are welcome to this seminar lecture
(45 minutes presentation followed by discussion).

U. Diebold e.h.
(Seminar-Chairperson)

F. Aumayr e.h.
(LVA-Leiter)