TEXAS STATE UNIVERSITY

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MSEC Seminar and Commercialization Forum

Invited Speaker:

Wilhelmus Geerts

"Characterization of Magnetic Materials using Biaxial Vibrating Sample Magnetometry"

October 18th, 2019
1:30 – 3:00 PM
RFM 3224

Biography:

Wilhelmus Geerts studied under Lodder and Popma at the University of Twente. Here he studied the surface properties of thin Co-Cr layers with various surface sensitive techniques including STM, AFM, XPS, Auger and Magneto-Optical Kerr magnetometry. Using Shannon's information theory he developed a model to estimate how surface artifacts such as oxidation-segregation scales, surface roughness, and demagnetizing effects, impact the maximum recording density in perpendicular magnetic recording media. The one-dimensional model estimated a maximum areal information density for magnetic recording of 6 Tb/inch^2 before surface effects will spoil further improvement. Such information densities have not been accomplished yet in commercial products as of 2019 (1.4 Tbit/inch^2).

In the early nineties he worked with Drs. Y. Suzuki and T. Katayama at ETL (Tsukuba, Japan) on the magneto-optical finite size effects in thin ferromagnetic films. Using a Jasco spectrometer the Kerr rotation of Fe and Co thin films was shown to oscillate as a function of the film thickness indicating confinement effects of excited states in the metallic thin films.

For more information or if you would like to have lunch with the speaker, please contact Dr. Shannon Weigum at sweigum@txstate.edu

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During a 2nd postdoc at NHMFL in Florida under supervision of Prof. Pearton and Childress, he developed MOKE3, a probe to measure the magneto-optical properties at low temperatures (down to 2 Kelvin) and in high magnetic fields. The probe allows one to measure the Kerr rotation and Kerr ellipticity in fields up to 20 tesla and still holds the world record as of today.

Wilhelmus Geerts joined Texas State in 1997 and has since worked with 100+ students on various research projects. His current research interest includes magnetic characterization of thin films and multilayer materials.

Abstract:

Characterizing magnetic materials normally starts with measuring the hysteresis curve (a graph that shows the magnetic moment of the material versus the applied field). This relation is non-linear and often has hysteresis that can be considered the "fingerprint" of the magnetic material. Magnetic hysteresis curves can be measured with a Vibrating Sample Magnetometer (VSM). This instrument vibrates the sample in between two or more pick-up coils, and the magnetic stray field of the sample causes an emf in the pickup coils that is measured with a lock-in amplifier. This signal is proportional to the magnetic moment of the sample. A large electromagnet is normally used to apply a magnetic field to the sample. Conventional VSMs measure the magnetic moment parallel to the field. One can often rotate the sample in the magnetic field and measure the hysteresis curve for different field angles.

Texas State has recently won an NSF-MRI grant and purchased a MicroSense biaxial VSM that can measure two components of the magnetic moment vector simultaneously. The instrument will allow measurements up to 3.3 tesla from 70-1000K. In this talk I will explain the VSM measurement principle and detail how the new instrument can be used to characterize powder samples and thin films.

FOR MORE INFORMATION OR IF YOU WOULD LIKE TO HAVE LUNCH WITH THE SPEAKER, PLEASE CONTACT DR. SHANNON WEIGUM AT SWEIGUM@TXSTATE.EDU