K 1: Optische Methoden und Verfahren

Zeit: Montag 14:00–15:30 Raum: HS 4

Hauptvortrag K 1.1 Mo 14:00 HS 4

Physikalische Messung am Beispiel von Photo und Film — •Rudolf Germer — ITPeV www.itp-berlin.net — TUBerlin

Aufgabe einer Messung ist es, Informationen zu erlangen. Die Genauigkeit ist dabei begrenzt durch Unschärfen physikalischer Natur (dx * dp > h, dE * dt > h) oder aus der begrenzten Genauigkeit der Messung selbst resultierend. Größen, die man beobachten kann, sind entweder physikalisch fundamental oder abgeleitet. Fundamental ist z.B. die abzählbare Größe der Ladung (Q = n * e), wie wir sie gespeichert auf einem Kondensator messen können. Abgeleitet in diesem Sinne ist der Strom (*I*=*dQ*/*dt*), bei dem wir die Änderung der Ladung oder vorbeilaufende Ladungen während eines Zeitintervalls dt, der beliebig wählbaren Meßdauer, registrieren. Die grundsätzlichen Probleme des *Messens* lassen sich anschaulich bei der Bildaufnahme beobachten. Elementar registrieren wir einzelne Photonen. Die passende Addition solcher registrierter Photonen führt zu den Größen Helligkeit, Farbe und ggf. den beobachteten räumlichen Strukturen und Bewegungen im Bild. So zeigen sich Unschärferelationen zwischen der Dynamik von Graustufen und zeitlichen oder örtlichen Auflösungsgrenzen. Interessant ist die Frage, wieviel auswertbare Information unsere Messung liefern kann oder wo die Art der Auswertung Teile der ursprünglich vorhandenen Information verschwinden lassen. In einem solchen Fall ist es nämlich möglich, durch unterschiedliche Wege der Datenverarbeitung jeweils einzelne Größen getrennt voneinander und parallel zueinander optimal zu projizieren. Die *Zeit* wird uns bei den Betrachtungen in unterschiedlichen Formen begegnen.

K 1.2 Mo 14:30 HS 4

Observing surface charges in oxide coatings on silicon surfaces with THz emission spectroscopy — •Ulrike Blumröder[1], Stefan Nolte[1,2], and Andreas Tünnermann[1,2] — [1]Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-University, Max-Wien-Platz 1, 07743 Jena, Germany — [2]Fraunhofer Institute for Applied Optics and Precision Engineering, Albert-Einstein-Straße 7, 07745 Jena, Germany

One mechanism leading to the emission of pulsed THz-radiation at semiconductor surfaces is the acceleration of photogenerated carriers in depletion or accumulation layers usually existing at semiconductor surfaces due to occupied surface states lying within the bandgap. The opposite direction of the depletion field in n- and p-doped semiconductors results in a flipping of the polarity of the emitted THz pulse as it has been observed for differently doped GaAs samples. On the other hand surface charges are also known to be present in oxide layers that are used for the passivation of silicon surfaces in the photovoltaic industry. Therefore they lead to the formation of a space charge layer beneath the silicon surface as well. We investigate the THz emission of thermally oxidized and ALD coated silicon wafers with THz emission spectroscopy and proved the existence of surface charges by investigating the polarity of the emitted THz pulse.

K 1.3 Mo 14:45 HS 4

Time-resolved measurements of magnetization precession in different exchange bias systems — •Andrea Ehrmann[1] and Tomasz Blachowicz[2] — [1]Hochschule Niederrhein, Faculty of Textile and Clothing Technology, Mönchengladbach, Germany — [2]Institute of Physics, Silesian University of Technology, Gliwice, Poland

Due to the large technological relevance, magnetization reversal processes in exchange bias systems are of great interest in recent research projects. In time-resolved measurements, the change of the anisotropy field (by a laser pulse, a field pulse etc.) leads to a precession of the magnetic moments in the sample. Angle-resolved measurements of the precession frequencies, e.g. by MOKE (Magneto-Optic Kerr-Effect) give rise to the sample's anisotropies. These experiments are significantly faster than common BLS (Brillouin Light Spectroscopie) measurements, thus allowing for a large number of detection angles.

In this way, different anisotropies in the exchange bias systems Fe/MnF2 and Fe/FeF2 can be detected. Additional to the form anisotropy, the interface anisotropy, and the magneto-crystalline anisotropy, the exchange bias anisotropy can be depicted. Our measurements show that in both systems under examination, a new mathematical model for the exchange bias has to be found, which leads to the assumption that accurate time-resolved measurements on other material systems can also give rise to novel theoretical descriptions of the exchange bias anisotropy.

[1] A. Tillmanns: Magnetisierungsumkehr und -dynamik in Exchange-Bias-Systemen, Dissertation, RWTH Aachen 2006

K 1.4 Mo 15:00 HS 4

Magnetization oscillations and rapid transient states in ferromagnetic nano-half-balls and wire systems with shape modifications — •Tomasz Blachowicz[1] and Andrea Ehrmann[2] — [1]Institute of Physics, Silesian University of Technology, Gliwice, Poland — [2]Hochschule Niederrhein, Faculty of Textile and Clothing Technology, Mönchengladbach, Germany

Hysteresis loops of 3D ferromagnetic nano-half-balls with 100 nm base diameter and different shape modifications have been examined using LLG micromagnetic simulations and finite element methods [1]. Depending on the direction of the externally applied field, strong oscillations of the magnetization can be recognized.

Comparing hysteresis loops with demagnetization and exchange energy densities and taking into account "snapshots" of the space-resolved magnetization, these oscillations can be attributed to different mechanisms, such as vortex precessions or domain wall oscillations. It can be shown that precession frequencies give rise to identification of the respective oscillation / precession mechanisms.

By taking into account different shape modifications, the simulations show feasible ways to diminish these oscillations, which can be critical in spin-valve systems, magnetic storage systems and other applications.

[1] T. Blachowicz, A. Ehrmann: Anatomy of Demagnetizing and Exchange Fields in Magnetic Nanodots Influenced by 3D Shape Modifications, Condensed Matter/Mesoscale and Nanoscale Physics arXiv.org preprint, cond-mat arXiv:1207.4673 (2012)

K 1.5 Mo 15:15 HS 4

Mass-selective discrimination of chirality by femtosecond coincidence imaging — •Carl Stefan Lehmann[1], Bhargava Ram[1], Ivan Powis[2], and Maurice Janssen[1] — [1]LaserLaB, Vrije Universiteit Amsterdam, Niederlande — [2]University of Nottingham, UK

In 1976 Ritchie [1] predicted that one-photon ionization with circular polarized light of chiral molecules results in a forward-backward asymmetry in the angular distribution of electrons. Experimentally, this asymmetry was first observed in 2001 in one-photon ionization with synchrotron radiation. This photo-electron circular dichroism (PECD) effect is up to three orders of magnitude larger than the conventional CD, as it results from normal electric dipole excitation.

Here We report femtosecond multi-photon ionization in combination with electron-ion coincidence imaging to mass-selectively discriminate chiral molecules. We demonstrate that this novel technique, using a table-top reaction microscope [2,3], can be used to detect mass-selected chiral molecules with high selectivity and sensitivity, which makes very promising as an analytical technique to characterize chiral samples.

[1] Phys. Rev. A 13, 1411 (1976).
[2] Rev. Sci. Instrum. 79, 063108 (2008).
[3] Rev. Sci. Instrum. 83, 093103 (2012).