

Abstracts **posters**: Alphabetical by presenter.

Abstracts

Posters

Alphabetical

by presenter

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- 1 **Lars Ramstad Alme**, NTNU, Complex
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WAXS studies of water transport in layered synthetic silicate

Abstract:

WAXS studies of water transport in a layered synthetic silicate

Lars Ramstad Alme, Jon O. Fossum, Yves Méheust
Department of Physics, Norwegian University of Science and Technology

We performed Wide Angle X-ray Scattering (WAXS) studies on different aspects of water transport through a powder sample of a nanoporous layered synthetic smectite clay, Na-fluorohectorite. Na-fluorohectorite crystallites, like all smectites, are able to swell due to intercalation of successive water layers between the fundamental layer silicate. Monitoring the intensities of the mono- and dihydrated intercalation Bragg peaks at different positions in the sample enabled spatial and temporal measurements of the proportions of the different hydration states.

From experiments with controlled temperature and an imposed humidity gradient on a quasi one-dimensional powder sample, we were able to localize the intercalation front and demonstrate the front to be very well described by a stretched exponential.

$$x = x_0 \left(1 - e^{-\left(\frac{t}{\tau}\right)^\beta} \right)$$

The width and speed of the front through the sample volume was demonstrated to increase with time.

Introducing a spatio-temporal scaling parameter, suggestions of anomalous diffusion behaviour were tested. However, the present data do not allow for any definite conclusions at this point.

Further studies on such water transport will be conducted in the near future.

Abstracts **posters**: Alphabetical by presenter.

- 2 **Jan Øystein Haavig Bakke**, NTNU, Complex
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Failures and avalanches in complex networks

Abstract:

Failures and avalanches in complex networks

Jan Øystein Haavig Bakke[†], Alex Hansen[†]

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János Kertész[‡]

[‡] *Institute of Physics, Budapest University of Technology*

We study the size distribution of power blackouts for the Norwegian and North American power grids. We find that for both systems the size distribution follows power laws with exponents -1.65 ± 0.05 and -2.0 ± 0.1 respectively. We then present a model with global redistribution of the load when a link in the system fails which reproduces the power law from the Norwegian power grid if the simulation are carried out on the Norwegian high-voltage power grid. The model is also applied to regular and irregular networks and give power laws with exponents -2.0 ± 0.05 for the regular networks and -1.5 ± 0.05 for the irregular networks. A presented mean field theory is in good agreement with these numerical results.

Abstracts **posters**: Alphabetical by presenter.

- 3 **Mark Buchanan**, Universitetet i Oslo, Complex
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Pattern formation in particle laden film suspensions

Abstract:

Pattern formation in particle laden film suspensions

Mark Buchanan, David Molenaar, Simon de Villiers and Mike Evans

1. Department of Physics, University of Oslo, Oslo, Norway 2. School of Physics, The University of Leeds, Leeds, UK.

We demonstrate the emergence of complexity from remarkably simple and ubiquitous systems: draining thin-film suspensions exhibiting a striking transition between two classes of self-organizing patterns. Vertical channels form when attractive forces lead to transient gelation, while horizontal bands result from granular mixtures. The generic physical mechanisms require only the existence of viscous and excluded-volume couplings between the particles, solvent and substrate. System-specific, small inhomogeneities trigger large-scale pattern formation, through collective dynamics, where jamming plays a crucial role. Our results shed light on emergent complexity in bio- and geo-physical processes, with implications for nano-manufacturing as well as coatings and food industries.

Abstracts **posters**: Alphabetical by presenter.

- 4 **Dmitry Denisov**, Universitetet i Oslo, Complex
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Dependence of dendritic flux avalanches on the size of the superconducting film

Abstract:

Dependence of dendritic flux avalanches on the size of the superconducting film

D.V. Denisov, D.V. Shantsev, Y. M. Galperin, Eun-Mi Choi, Hyun-Sook Lee, Sung-Ik Lee, A.V. Bobyl, P.E. Goa, A.A.F. Olsen and T. H. Johansen
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The thermomagnetic instability or flux jumping is commonly observed at low temperatures in type-II superconductors with strong pinning. This effect can result in thermal runaways and global flux redistributions jeopardizing superconducting devices. Such instabilities can be observed magneto-optically and often they lead to a highly-nonuniform, dendritic flux pattern.

The measurements were made on a series of strip-shaped MgB₂ films having different width. It is shown experimentally that the dendrite appearance is controlled not only by temperature, electrical and magnetic fields but also by the sample size. Using thermo-magnetic model published recently [Phys. Rev. B 73, 014512 (2006)] we get an excellent agreement with experiment data for the key features like the stability onset (first dendrite appearance) magnetic field, and how the onset field depends on both temperature and sample size. Detailed comparison of experimental data and theoretical results shows that the model is well suited for predictions of dendritic flux instability in MgB₂ samples. Excellent agreement is also obtained by reanalyzing data previously published for Nb. We demonstrate that the instability can be avoided for sufficiently narrow strips, which is of particular importance for design of superconducting electronic devices or other applications making use of thin film superconductors operating at temperatures below the instability threshold value.

Abstracts **posters**: Alphabetical by presenter.

- 5 **Jon Otto Fossum**, NTNU, Complex
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Spontaneous and guided self-assembly of clay nanoplatelets

Abstract:

Spontaneous and guided self-assembly of clay nanoplatelets

Dept. of Physics, Norwegian Univ. of Science and Technology, Trondheim, Norway

Jon O. Fossum ¹, Yves Meheust, Kanak P.S. Parmar, Davi M. Fonseca

Dept. of Physics, Inst. for Energy Technology, Kjeller, Norway Kenneth D. Knudsen

Dept. of Physics, Univ. of Oslo, Norway Knut J. Maloy

We study (i) spontaneous phase separation and nematic self-assembly in gravity of synthetic clay particles in aqueous suspensions, and (ii) guided self-assembly into chainlike structures of polarized clay particles in oil suspensions (electrorheological behavior). Experimental techniques used are synchrotron X-ray scattering, rheometry and microscopy. We demonstrate that clays may be used as good model systems for self-assembled soft and complex matter, and we give examples of interconnected complex physical phenomena in such systems. Self-assembly in clays may have practical relevance for nano-patterning, properties of nanocomposites, and macroscopically anisotropic gels.

References

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- [2] J.O.Fossum, Y.Meheust, K.P.S.Parmar, K.D.Knudsen, K.J.Maloy, D.M.Fonseca, Intercalation-enhanced electric polarization and chain formation of nano-layered particles, Europhys. Lett., 74 (3), pp. 438-444 (2006)

Abstracts **posters**: Alphabetical by presenter.

- 6 **Jon Otto Fossum**, NTNU, Complex
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SAXS and SANS investigations of Colloidal Dispersions of Magnetic Nanoparticles and Clay Nanoplatelets

Abstract:

SAXS and SANS investigations of Colloidal Dispersions of Magnetic Nanoparticles and Clay Nanoplatelets

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(Received 0 XXXXXXXX 0000, accepted 0 XXXXXXXX 0000)

Physics of Colloidal Dispersions, Composite materials, SANS, SAXS

Abstract

We investigate mixed colloidal dispersion of clays platelets and magnetic nanoparticles using small angle scattering experiments; SANS and SAXS. Our results show that the contribution to the scattering essentially is due to the magnetic nanoparticles. The scattered intensities are proportional to the concentration of magnetic particles, indicating colloidal dispersion of non-interacting magnetic objects from the scattering point of view, although laponite and magnetic particles clearly interact when our sample textures are observed visually in an optical microscope. The visually observed phase separation may be characterized as a liquid-gas transition.

Abstracts **posters**: Alphabetical by presenter.

- 7 **Davi d. M. Fonseca**, NTNU, Complex
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Phase behavior of platelet-shaped nanosilicate colloids in saline solutions – a SAXS study

Abstract::

Phase behavior of platelet-shaped nanosilicate colloids in saline solutions – a SAXS study

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Abstract A study of polydisperse suspensions of fluorohectorite clay in saline solutions is presented. The suspended clay colloids consist of stacks of several tenths of 1 nm-thick nanosilicate sheets. They are polydisperse both with respect to the number of stacked nanolayers and with respect to their extension along the sheets. Due to this polydispersity, a spontaneous gravity-induced vertical segregation occurs in the sample tubes, and results in the presence of up to four different phases on top of each other. Precise characterization of the phase diagram of the samples as a function of salt concentration and vertical position in the tubes, based on Small Angle X-ray Scattering data is presented. The vertical positions of the phase boundaries were monitored by analyzing the eccentricity of elliptic fits to iso-intensity cuts of the scattering images. The intensity profiles along the two principal directions of scattering display two power law behaviors with a smooth transition between them, and show the absence of positional order in all phases.

Abstracts **posters**: Alphabetical by presenter.

- 8 **Ahmed Gmira**, NTNU, Complex
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Laponite nanoparticle droplet evaporation on a glass surface: “The coffee stain effect” studied by AFM

Abstract:

Laponite nanoparticle droplet evaporation on a glass surface:

“The coffee stain effect” studied by AFM

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Department of Physics, NTNU

Ring formation in an evaporating droplet is a hydrodynamic process in which solid particles dispersed in the drop are transported towards, and concentrated along the droplet contact line. After all the liquid has evaporated, a ring-shaped deposit is left on the substrate that contains almost all the solid particles. This is often called “the coffee stain effect” [1].

Here we study the evaporation of water droplets containing dispersed synthetic laponite nanoparticles [2], deposited on a glass surface. Both the ring formation, and the role of the evaporation process, are investigated by Atomic Force Microscopy (AFM) on both hydrophobic and hydrophilic surfaces

[1]- R. D. Deegan, O. Bakajin, T. F. Dupont, G. Huber, S. R. Nagel and T. A. Witten, Nature 389, 827 (1997).

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Abstracts **posters**: Alphabetical by presenter.

- 9 **Ahmed Gmira**, NTNU, Complex
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Water Na-fluotohectorite interactions; An AFM study

Abstract:

Water Na-fluotohectorite interactions; An AFM study

A. Gmira and J. O. Fossum

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Water-clay interactions have been widely studied by means of X-ray scattering techniques. However, direct observations from microscopical studies of such processes are still lacking. The aim of the present study is to investigate dehydration and rehydration processes of Na-Fluohectorite (synthetic layered 2:1 clay) by means of Atomic Force Microscopy.

Shrinkage and swelling phenomena due to water monolayer by monolayer intercalation into a system of stacked nanoplatelets are observed at the micrometer scale (platelets stacks behaviour) and at the nanometer scale (down towards atomic resolution) using in-situ observations in dry and humid conditions.

Abstracts **posters**: Alphabetical by presenter.

- 10 **Martin S. Grønsløth**, NTNU
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Interplay between ferromagnetism and superconductivity in tunneling currents

Abstract:

Interplay between ferromagnetism and superconductivity in tunneling currents

Martin S. Grønsløth
Department of Physics, NTNU

We study tunneling currents in a model consisting of two non-unitary ferromagnetic spin-triplet superconductors separated by a thin insulating layer. We find a novel interplay between ferromagnetism and superconductivity, manifested in the Josephson effect. This offers the possibility of tuning dissipationless currents of charge and spin in a well-defined manner by adjusting the magnetization direction on either side of the junction.

Abstracts **posters**: Alphabetical by presenter.

- 11 **Øivind Haugen**, Universitetet i Oslo, Complex
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High resolution thermal imaging of hotspots in superconducting films

Abstract:

High resolution thermal imaging of hotspots in superconducting films

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Thermal imaging of hotspots in bridge structures of YBaCuO thin films is presented with micrometer resolution. Hotspots formed by passing transport currents are observed using a method based on the temperature dependence in the photoluminescence of a polymer thin film deposited on the superconductor. It is shown that, e.g., passing a current of 10 mA in a 9 micrometer wide bridge the temperature distribution over the bridge and in its vicinity can be observed with a resolution better than 0.1 K. The local temperature rise has a maximum of 4.5 K. In a larger superconducting network several hotspots are observed in different branches of the network depending on the magnitude of the applied current. In an external magnetic field the hotspots are formed at lower transport current and at several seconds delay. It is also found that states with hotspots show hysteretic or bistable behavior, in agreement with earlier theoretical predictions. Also details of the experimental method will be reported.

Abstracts **posters**: Alphabetical by presenter.

- 12 **Mihailo Jankov**, Universitetet i Oslo, Complex
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Two-dimensional displacement of wetting phase in the presence of oscillatory pressure in the non-wetting phase

Abstract:

Two-dimensional displacement of wetting phase in the presence of oscillatory pressure in the non-wetting phase

Mihailo Jankov, Knut Jørgen Måløy, Ramon Planet and Grunde Løvoll
Department of Physics, University of Oslo

Slow drainage in a porous medium is experimentally investigated in the presence of oscillatory pressure. A glycerol-water solution is being withdrawn at a low speed with a pressure oscillation applied to the non-wetting phase (air). By tuning the amplitude and the frequency different displacement structures are observed. Our goal is to get to know more about the physics behind the formation of different flow patterns by systematically changing the amplitude and the frequency of the oscillation.

Abstracts posters: Alphabetical by presenter.

- 13 **Øistein Johnsen**, Universitetet i Oslo, Complex
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Coupled air/grain flow in a Hele-Shaw cells

Abstract:

Coupled air/grain flow in Hele-Shaw cells

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We consider, both experimentally and numerically, loosely packed dry granular materials confined in rectangular and circular Hele-Shaw cells being displaced by injection of a fluid. This is a mixed fluid and particle flow problem not yet addressed, although there is a vast literature on similar studies for bi-phasic flow of Newtonian and non-Newtonian fluids, suspensions, flow in porous media and the like. Depending on the injection pressure, cell size and geometry, the geometrical features and dynamics of the emptied displacement patterns changes characteristics

For the rectangular cell geometry we recognize four hydrodynamical regimes with well defined thresholds: 1) The injected air permeates through the pore space of the packing with no detectable particle motion. 2) A pattern empty of grains appear with a front that can be nearly linear or slightly bulged. 3) A bulged pattern larger than in the second regime is obtained, saturating for some short "waiting time", before developing into a finger that breaks through the granular packing. 4) The finger formation works its way through the packing without any waiting time at all. In the circular case the four regimes are recognized by; 1) no detectable grain motion, 2) small central and nearly circular displacement pattern emptied of grains, 3) a slightly to highly ramified pattern, and 4) a ramified pattern that breaks through the granular packing.

During the process of a finger breaking through the granular packing, the interior of the emptied structure is eroded by the air flow.. In addition to the highly visible patterns emptied of grains formed during the displacement process, we can distinguish three other regions with different solid fractions using image subtraction. Ahead of the emptied zone the material is compacted at a certain depth determined by the area of the displacement pattern and the loose and close packed fractions. The material stays unperturbed with the initial packing density in front of the compacted region. For some injection pressures though, we observe that the particles around the free boundary at the open end of the cell is being decompact

Similar to classical two fluid Saffman-Taylor fingering the pressure gradient is the driving force. The stabilizing phenomena on the other hand, is not surface tension as for a two-fluid system. Dealing with instabilities in a miscible solid-fluid case, the stabilizing phenomena is not surface tension as for a two-fluid system, but increased friction between the granular matrix and the confining plates. In the compacted region friction opposing the granular movement is induced as the granular packing is pushed upon, known as the Janssen effect. The mixed solid-fluid situation gives rise to features like decompaction and bubble formations in addition to fingers formed under instable conditions.

Abstracts **posters**: Alphabetical by presenter.

- 14 **Mari Juel**, NTNU, Complex
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Surface alloy formation after Ce deposition on Rh(110)

Abstract:

Surface alloy formation after Ce deposition on Rh(110)

M. Juel, B. T. Samuelsen, M. Kildemo, S. Raaen
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Vapour deposition of Ce onto a Rh(110) single crystal at room temperature is studied by X-ray photoelectron spectroscopy (XPS), ultraviolet photoelectron spectroscopy (UPS) and low energy electron diffraction (LEED). The thicknesses of the deposited Ce-layers are estimated to be between 0.5 and 2.5 monolayer. After Ce deposition the samples are annealed in steps of 100 °C up to 1000 °C to follow the formation of the surface alloy. For the samples with an as deposited Ce layer thicker than a monolayer the appearance of a clear $c(2\times 2)$ LEED pattern occurs after annealing to the same temperature as clear shifts both in the intensity and in the binding energy for the Rh 3d and the Ce 3d core levels are observed. This is taken as an indication of alloy formation in the surface region. The XPS measurements also exhibits a strong Ce 3d f_2 core level peak, that indicates a strong hybridization between the 4f level of the Ce atom and the conduction state of the transition metal [1, 2]. The topmost layer of the alloy is found to be less hybridized. Strong hybridization is representative for α -like (tetravalent) Ce compounds, while γ -like (trivalent) Ce compounds exhibit weak hybridization. It is therefore proposed that the Ce-Rh alloy formed on top of the Rh(110) substrate has a α -like bulk structure with a γ -like surface.

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[2] J. C. Fuggle, F. U. Hillebrecht, Z. Zolnierrek, R. Lässer, Ch. Freiburg, O. Gunnarsson, K. Schönhammer, Phys. Rev. B 27 (1983) s. 7330

Abstracts **posters**: Alphabetical by presenter.

- 15 **Henning Arendt Knudsen**, Universitetet i Oslo, Complex
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Maze patterns in a Hele-Shaw cell

Abstract:

"Maze patterns in a Hele-Shaw cell".

Henning Arendt Knudsen, Universitetet i Oslo

"Pattern forming processes are abundant in Nature. Here, we report on a particular pattern forming process. Upon withdrawal of fluid from a particle/fluid dispersion in a Hele-Shaw cell, the particles are shown to be left behind in intriguing maze-like patterns. The particles, initially being uniformly spread out in a disc, are slowly pulled inwards and together by capillary forces. Invading air forms branching fingers, whereas the particles are clumped into comparably narrow branches. These branches are connected in a tree-like structure, taking the form of a maze. The characteristic wavelength within the structure is found to decrease with the volume fraction of the particles and increase with the plate separation in the Hele-Shaw cell. We present a simulator designed to simulate this phenomenon. Experimental and simulated results are shown to be in qualitative and quantitative agreement."

Abstracts **posters**: Alphabetical by presenter.

- 16 **Kenneth D. Knudsen**, Institutt for energiteknikk, IFE, Kjeller, Complex
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The porous space inside bundles of polarized phyllo-silicate crystallites – A SAXS study

Abstract:

The porous space inside bundles of polarized phyllo-silicate crystallites – A SAXS study

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Kenneth D. Knudsen^b and Davi de Miranda Fonseca^a**

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When submitted to a strong electric field, crystallites of Na-fluorohectorite clay suspended in a silicon oil acquire an induced electric dipole. Their subsequent interactions lead to aggregation into chain-like structures parallel to the applied electric field. We have used Small Angle X-Ray scattering to get insight into the geometry of the porous medium in these structures. The 2D SAXS images exhibit a marked anisotropy, which is analyzed by fitting ellipses to iso-intensity lines. This also provides principal directions along which one-dimensional spectra are computed. They display several power law behaviors, typical of porous media, separated by crossovers. The values for the power law exponents indicate that surface scattering is dominant, while the crossovers provide typical length scales for the clay particle bundles. The corresponding "picture" of the particle assembly inside the bundles complements that inferred from WAXS data in a previous study.

Abstracts posters: Alphabetical by presenter.**17 Yves Meheust**, NTNU, Complex

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*Mesoscopic structure of dried-pressed clay samples from SAXS measurements***Abstract:**

Mesoscopic structure of dried-pressed clay samples from SAXS measurements

Y. Méheust¹, S. Dagois-Bohy¹, K. D. Knudsen² and J. O. Fossum¹¹ *Physics Department, Norwegian University of Science and Technology (NTNU), Trondheim, Norway*² *Physics Department, Institute for Energy Technology (IFE), Kjeller, Norway*

We study weakly-hydrated samples of clay obtained by dry-pressing (uniaxial stress) suspensions of the synthetic smectite fluorohectorite in water. The particles consist of stacks of several tenth of 1nm-thick nanosilicate sheets [1, 2]. They form a compound of quasi-2D particles whose average director is aligned with the direction of the uniaxial stress applied at dehydration (see Fig. 1). The orientation distribution of these platelet-shaped particles in the samples have previously been studied from Wide Angle X-ray Scattering measurements, as a function of the particles' hydration state [3]. On the other side, Small Angle Neutron Scattering was used in order to investigate the mesoscopic space in between the particles [4].

In the present study, we use Small Angle X-ray Scattering experiments performed at the DUBBLE beam line, at ESRF (France), with a considerable wider q -range than previously available with the SANS. The anisotropy of the 2D scattering images is analyzed so as to infer particle orientations inside the samples. For this, ellipses are fitted to iso-intensity cuts of the images; the ellipse eccentricity accounts for the anisotropy of the scattering. This is compared to orientation distributions previously obtained from WAXS data [3]. Besides, the power law decay of the scattered intensity as a function of the momentum transfer along the two principal directions of iso-intensity cuts provides information on the meso-porosity in between the samples, as well as on the particle roughness, depending on the scale range considered. This part of the study is a continuation of the study by Knudsen et al. [4]. The crossover scale between the two power law behaviors is the typical particle thickness.



Fig. 1. Vertical cut of a dry-pressed clay sample; the platelet-shaped particles have a strong tendency to be aligned with the horizontal direction (the stress was applied vertically at dehydration).

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- [3] Y. Méheust, J. O. Fossum, K. D. Knudsen, K. J. Måløy, and G. Helgesen, *Mesostructural changes in a clay intercalation compound during hydration transitions*, preprint submitted (2005).
- [4] K. D. Knudsen, J. O. Fossum, G. Helgesen, and M. W. Haakestad. *Physica B* **352**(1-4), 247 (2004).

Abstracts **posters**: Alphabetical by presenter.

- 18 Åge Andreas Falnes Olsen, Universitetet i Oslo, Complex
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Flux dendrites of opposite polarity in superconducting MgB₂ rings

Abstract:

Flux dendrites of opposite polarity in superconducting MgB₂ rings

Å. A. F. Olsen, T. H. Johansen, D. V. Shantsev, E.-M. Choi, H.-S. Lee, H.
J. Kim and S.-I. Lee
Physics Department, University of Oslo

Magneto-optical imaging was used to observe flux dendrites with opposite polarities simultaneously penetrating superconducting, ring-shaped MgB₂ films. By applying a perpendicular magnetic field, branching dendritic structures nucleate at the outer edge and abruptly propagate deep into the rings. When these structures reach close to the inner edge, where flux with opposite polarity has penetrated the superconductor, they occasionally trigger anti-flux dendrites. These anti-dendrites do not branch, but instead trace the triggering dendrite in the backward direction. The interaction between dendrites of flux and anti-flux will be discussed.

Abstracts **posters**: Alphabetical by presenter.

- 19 **Bjornar Sandnes**, Universitetet i Oslo, Complex
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Optical trapping and microrheology in complex fluids

Abstract:

Optical trapping and microrheology in complex fluids

Bjornar Sandnes¹, Mark Buchanan¹, Knut Jørgen Måløy¹, Geir Helgesen²
and Jon Otto Fossum³

¹Physics Departemnt, University of Oslo

²Physics Department, IFE

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We present current progress of microrheology experiments using optical traps. Particles embedded in a sample can be trapped using an optical tweezer technique. By measuring the scattered light from the trapped particle, the random fluctuations of the particle can be measured. This can be used to obtain the viscoelastic response functions of the medium to very high frequency. We exploit this technique to study a variety of complex materials. Exotic surfactant assemblies such as rod-like micelles and the sponge phase show interesting rheological properties up to ultra-high frequencies.

Abstracts **posters**: Alphabetical by presenter.

- 20 **Bo-Sture K Skagerstam**, NTNU, Complex
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Spin Decoherence in Superconducting Atom Chips

Abstract::

Spin Decoherence in Superconducting Atom Chips

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Using a consistent quantum-mechanical treatment for the electromagnetic radiation, we theoretically investigate the magnetic spin-flip scatterings of a neutral two-level atom trapped in the vicinity of a superconducting body. We derive a simple scaling law for the corresponding spin-flip lifetime for such an atom trapped near a superconducting thick slab. For temperatures below the superconducting transition temperature T_c , the lifetime is found to be enhanced by several orders of magnitude in comparison to the case of a normal conducting slab. At zero temperature the spin-flip lifetime is given by the unbounded free-space value.

Abstracts **posters**: Alphabetical by presenter.

- 21 **Rune Strandberg**, NTNU
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PC1D-simulations for solar cells with areas of enhanced infrared absorption

Abstract::

PC1D-simulations for solar cells with areas of enhanced infrared absorption.

Rune Strandberg, Turid Worren
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Results from simulations of solar cells with regions of enhanced infrared absorption are presented. Such regions are found in the intermediate band solar cell (IBSC) where there are areas where more infrared photons can be absorbed than in the rest of the cell. The simulations show that the optimum position of the infrared-absorptive areas (IAA) within the cell depends on the material properties. Two important parameters, the carrier lifetimes in the IAA and the back surface recombination velocity, are found to be crucial when choosing the cell design. The software PC1D has been used to carry out the simulations

Abstracts **posters**: Alphabetical by presenter.

- 22 **Henrik Tollefsen**, NTNU, Complex
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Surface investigation of Ce-Pd alloys

Abstract:

Surface investigation of Ce-Pd alloys

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In this work XPS, UPS, LEED, and PEEM was used to characterize Pd(110) and Pd(111) mono crystals after in situ evaporation deposition of thin film Ce. We study the properties of the systems while annealing with two different Ce layers, 0,5 ML and 1,5 ML. The 0,5 and 1,5 ML systems exhibit similar physical properties and there is no major difference between the two Pd crystals. The Ce-Pd alloying is found to saturate after annealing to 700°C for all systems. CePd_3 seems to be present at the initial anneal stages, while a stoichiometry closer to CePd_7 with an epitaxial Pd layer fits our results better at higher annealing temperatures i.e, $500\text{-}700^{\circ}\text{C}$. While annealing the systems the Ce valence becomes crystal surface termination dependent. The 0,5 ML and 1,5 ML systems have a valence prior to annealing of respectively $3,08 \pm 0,01$ and $3,04 \pm 0,01$ for both crystals. In the Pd(110) case a maximum value of about 3,19 is reached after about $500\text{-}600^{\circ}\text{C}$, while the Pd(111) system reaches a maximum value of about 3,22 after 700°C . In general the Pd(111) crystal seems to be more influenced by the initial Ce deposition, than the Pd(110) crystal. In the oxidation part of our work, the main focus was on the 1,5 ML Ce on Pd(110) and Pd(111) crystals. A Ce_2O_3 with a CeO_2 over layer is suggested to have formed after the oxidation. We estimate the relative amount of Ce_2O_3 and CeO_2 to have the weight of 3 and 4 respectively. The final oxidation LEED pattern picture of the Pd(110) system exhibit tendencies of a $p(4/3 \times \infty)$ superstructure, while the Pd(111) system exhibit tendencies of a weak $p(4 \times 4)$ superstructure.

Abstracts **posters**: Alphabetical by presenter.

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Crumpled paper

Abstract:

CRUMPLED PAPER

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We have studied several properties of crumpled paper. The main area under investigation is the network formed by the ridges produced when a sheet of paper is crumpled into a small ball. The height profile of several sheets of crumpled paper that have been carefully flattened has been measured with a profilometer. The ridge network has been extracted by locating lines of high curvature. The degree distribution, ridge length distribution and the clustering has been investigated. The clustering is found to be considerably higher than in random networks and the length distribution is fitted to an exponential. Also the Hurst exponent of the 1D profiles have been investigated and a cross over behaviour registered. Further work is needed to complete the investigation.

Abstracts **posters**: Alphabetical by presenter.

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Effect of AC-field on the stability of superconducting thin film of MgB₂ and Nb

Abstract:

Effect of AC-field on the stability of superconducting thin film of MgB₂ and Nb

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Application of a magnetic field of sufficient intensity orthogonal to superconducting thin films of MgB₂ and Nb produces dendritic patterns, where penetrated and Meissner regions coexist, as a result of the enormous demagnetizing factor in the perpendicular geometry. Since this out of equilibrium pattern of flux penetration into the thin superconducting film occurs, the critical-state model failure for a wide region of the phase diagram. Magnetic measurements have shown that the AC field is able to trigger avalanches of vortices and bring the instability forward when the applied field is increased gradually.