DY 68: Poster: Complex Fluids, Glasses, Granular

Time: Thursday 15:30–18:00 Location: Poster A

DY 68.1 Thu 15:30 Poster A

Shape, Friction and Cohesion in Granular Packings — •Simon Weis[1], Gerd Schröder-Turk[1,2], and Matthias Schröter[3] — [1]Theoretische Physik1, FAU Erlangen, Germany — [2]School of Engineering and IT, Murdoch University, Australia — [3]Institute of Multiscale Simulations, FAU Erlangen, Germany

Friction and adhesive forces are important parameters for the stability of granular packings. We analyze packings of wetting and non wetting spheres of different sizes and triaxial ellipsoids with different aspect ratios. The structural properties of packings are analyzed with respect to the particle's shape, their friction and adhesive forces. Interparticle friction is changed by grinding the particles with different abrasives and by applying liquid and dry lubricants, which also changes adhesive forces. Adhesive forces are changed by adding water with a surfactant to the packing. Various packings with a range of friction coefficients and liquid contents are prepared at various packing fractions by vertical tapping.

To obtain structural properties, the packings are recorded by X-ray tomography and particles as well as liquid clusters are detected. Structural characterization includes mean and local packing fractions, contact numbers as well as (Set-)Voronoi cell anisotropy by Minkowski tensors.

We show that, although friction has an impact on the mechanical characteristics, the analyzed local structural features remain unchanged. The effect of adhesive forces correlates with particle size.

DY 68.2 Thu 15:30 Poster A

Paranusseffekt unter geometrischer Kohäsion — •Barbara Maier[1] und Thomas Grillenbeck[2] — [1]Ignaz-Günther-Gymnasium Rosenheim — [2]FH-Rosenheim University of Applied Sciences

Der Paranusseffekt ist ein Problem, das die Wissenschaft schon seit geraumer Zeit beschäftigt,vor allem weil es noch keine endgültige Lösung für dieses Phänomen gibt und zum anderen bereitet es beispielsweise in der Pharma- und Lebensmittelindustrie viele Probleme, da sich granulare Mischungen auf ihrem Transport immer entmischen. Wie kann man das also verhindern? Tackerklammern bringen aufgrund ihrer sich verhaken den Form jedenfalls schon mal große Vorteile mit sich, denn dadurch wird der Effekt um einen Großteil verlangsamt. Doch wie kann man das alles optimieren oder kann man den Effekt sogar ganz unterdrücken?

DY 68.3 Thu 15:30 Poster A

Light-Driven Reversible Clustering and Separation of Colloids — •Pooja Arya, David Feldmann, and Svetlana Santer — Institute of Physics and Astronomy, University of Potsdam, 14476Potsdam, Germany

We report on colloids that can be reversibly clustered and separated when illuminated with light of different wavelengths. This is possible to achieve when porous colloids are dispersed in a solution containing a photosensitive surfactant. Under illumination with light it undergoes a reversible trans-cis isomerization accompanied by the changes in dipole moment, shape and size. When a solution of photosensitive surfactants is irradiated with focused light, the formation of local hydrodynamic flow at the solid/liquid interface takes place. The phenomenon is known as light-driven diffusioosmosis (LDDO) [1]. Porous particle provides a large area for surfactant to adsorb. When these porous micron-sized silica particles are dispersed in the surfactant solution, they spontaneously cluster at a solid surface. During illumination with blue light, the colloids separate within a few seconds forming equidistant particle ensemble. The long-range hydrodynamic repulsion results in distances between particles (5 micrometer in diameter) up to 80 micrometer. We report on how this process depends on surfactant concentration and irradiation wavelength.

[1] D. Feldmann, S. R. Maduar, M. Santer, N. Lomadze, O. I. Vinogradova, S. Santer *Manipulation of Small Particles at Solid Liquid Interface: Light Driven Diffusioosmosis* Scientific Reports 6 (2016) 36443.

DY 68.4 Thu 15:30 Poster A

Reversed Currents in Charged Liquid Bridges — •Klaus Morawetz — Münster University of Applied Sciences,Stegerwaldstrasse 39, 48565 Steinfurt, Germany — International Institute of Physics- UFRN,Campus Universitário Lagoa nova,59078-970 Natal, Brazil — Max-Planck-Institute for the Physics of Complex Systems, 01187 Dresden, Germany

The velocity profile in a water bridge is reanalyzed. Assuming hypothetically that the bulk charge has a radial distribution, a surface potential is formed that is analogous to the Zeta potential. The Navier-Stokes equation is solved, neglecting the convective term; then, analytically and for special field and potential ranges, a sign change of the total mass flow is reported caused by the radial charge distribution. [Water 9 (2017) 353]

DY 68.5 Thu 15:30 Poster A

Measuring the buckling of a chain of permanent magnets under load – comparison with the elastica model — •Lucas Bartosch, Ingo Rehberg, and Reinhard Richter — Experimentalphysik 5, Universität Bayreuth

A one-dimensional chain of spherical neodymium-iron-boron magnets responds to mechanical loadings in a manner reminiscent of an elastic rod, which was recently described by introducing an effective magnetic bending stiffness [1]. We are investigating the deformation of such a chain resting on a plain by means of images recorded by a digital camera. The positions of the magnets are extracted utilizing OpenCV for image processing. The distance between the two endpoints of the chain is manipulated via a computer controlled stepper motor. Moreover, the lateral force is recorded with a magnetic insensitive force gauge. We are investigating the shape of such a macroscopic chain using digital image processing and compare it to the classical elastica model. In this comparison we find sneaky deviations around an ideal course of the spheres, which may be caused by friction in-between the spheres [2].

[1] D. Vella, E. du Pontavice, C. L. Hall and A. Goriely, *Proc. R. Soc. A* **470**, 20130609 (2013).

[2] I. Rehberg, Comment on: "Stability of vertical magnetic chains", by Johannes Schönke and Eliot Fried, *Proc. R. Soc. A* **473**, 20160703 (2017).

DY 68.6 Thu 15:30 Poster A

Why beam hardening is necessary to measure volume fractions in granular packings — •Manuel Baur[1], Norman Uhlmann[2], Thorsten Pöschel[1], and Matthias Schröter[1] — [1]MSS, FAU, Germany — [2]Fraunhofer Institute for Integrated Circuits, Fürth, Germany

We study density waves in a fluidized bed via x-ray radiography. Dense regions in the bed attenuate the x-rays stronger than dilute ones and result in darker gray values. The commonly used Lambert-Beer law, to describe the photon attenuation, is just valid for monochromatic x-ray beams. Industrially used x-ray tubes do not emit a monochromatic beam, but the broad Bremsstrahlung spectrum. In this case the attenuation coefficient depends on the photon energy. High energy photons are attenuated less than weak energy photons. The ratio of high to low energy photons in the spectrum of the x-ray beam increases after transmitting a slab of material - the beam hardens. An understanding of beam hardening is necessary to quantize density fluctuations in a fluidized bed from radiograms. We present a technique to access the x-ray attenuation as a function of transmitted material thickness and show how the transmitted thickness can be deduced from that.

DY 68.7 Thu 15:30 Poster A

Analytical mesoscale modeling of aeolian sand transport — Marc Lämmel and •Klaus Kroy — Institut für Theoretische Physik, Universität Leipzig, Leipzig, Germany

The mesoscale structure of aeolian sand transport determines a variety of natural phenomena studied in planetary and Earth science. We analyze it theoretically beyond the mean-field level, based on the grain-scale transport kinetics and splash statistics. A coarse-grained analytical model is proposed and verified by numerical simulations resolving individual grain trajectories. The predicted height-resolved sand flux and other important characteristics of the aeolian transport layer agree remarkably well with a comprehensive compilation of field and wind-tunnel data, suggesting that the model robustly captures the essential mesoscale physics. By comparing the predicted saturation

length with field data for the minimum sand-dune size, we elucidate the importance of intermittent turbulent wind fluctuations for field measurements and reconcile conflicting previous models for this most enigmatic emergent aeolian scale.

DY 68.8 Thu 15:30 Poster A

Electro-osmotic pumping for structured coatings — •Raheema Muhammad Aslam, Ran Niu, and Thomas Palberg — Institute of Physics, JGU Mainz, Germany

We assemble charged colloidal spheres at deliberately chosen locations on a charged unstructured glass substrate utilizing ion exchange based micro-pumps. The pump uses trace amounts of ions to generate electroosmotic fluid flows. We show experimentally that our pump operates in almost deionized water for periods exceeding 24 h and induces fluid flows in micrometer per second over hundreds of micrometers. This flow displays a far-field, power-law decay which is characteristic of two-dimensional (2D) flow when the system is strongly confined and of three-dimensional (3D) flow when it is not. Experimentally, we systematically explore the control parameters of crystal assembly at and by micro-pumps and the mechanisms through which they depend on the experimental boundary conditions. We demonstrate that crystal quality depends crucially on the assembly distance of the colloids. This is understood as resulting from the competition between inward transport by the electro-osmotic pump flow and the electro-phoretic outward motion of the colloids. Optimized conditions include substrates of low and colloids of large electro-kinetic mobility. Then a sorting of colloids by size is observed in binary mixtures with larger particles assembling closer to the ion exchanger beads. Moreover, mono-sized colloids form defect free single domain crystals which grow outside a colloid-free void with facetted inner crystal boundaries centred on the ion exchange particle.

DY 68.9 Thu 15:30 Poster A

Binary mixtures of helical Yukawa rods studied by Monte Carlo simulations — •Motoya Suzaka, Anja Kuhnhold, and Tanja Schilling — Institute of Physics in University of Freiburg, Freiburg, Germany

Systems composed of chiral rod-like particles have a complex phase diagram. The main phases are isotropic, nematic, smectic and especially the cholesteric phase. To assess such complex phase diagrams, Monte-Carlo(MC) simulations can be applied. As model system we use helical Yukawa rods where the chirality is due to point charges, that are helically wrapped around the surface.

Of special interest for technical application is the cholesteric pitch in the equilibrium state. We started to study monodisperse systems first. But more meaningful for comparisons to experimental systems are studies on polydisperse systems. The simplest kind of a polydisperse system is a binary one. We therefore use binary mixtures with different particle lengths, surface charges or internal pitches. To simulate the equilibrium cholesteric phase we apply MC simulations and special boundary conditions.[1]

[1] A. Kuhnhold and T. Schilling, J. Chem. Phys. 145, 194904 (2016).

DY 68.10 Thu 15:30 Poster A

Percolation and Conductivity of Network of Hard Rods under Mechanical Load — •Arshia Atashpendar and Tanja Schilling — Physikalisches Institut, Albert-Ludwigs-Universität, 79104 Freiburg, Germany

Electrically conductive, soft nano-composites are of technological interest e.g. as transparent electrodes and as sensors. The dielectric behaviour of these systems under varying mechanical conditions still remains poorly investigated. Thus, in order to better understand the conductivity properties of dispersed conductive nano-particles in an insulating matrix, we use Monte Carlo simulations to study how the structure of the percolating network, the conductivity and the diffusive properties of a system of isotropic hard rods are affected by mechanical load. The conductance between pairs of rods is considered under the assumption that single electron tunneling is the sole dominant process for electrical connectedness.

DY 68.11 Thu 15:30 Poster A

Growth and Interaction of Colloid Nuclei under Microgravity — •Lou Kondic[1], Michael Lam[1], Boris Khusid[1], and William Meyer[2] — [1]NJIT, Newark, NJ, USA — [2]Glenn Research Center, Cleveland, OH, USA

We have developed a model describing the growth and interaction of colloid nuclei. The model is based on a coupled diffusion problem for the solid and liquid phase, combined with the consistent boundary conditions involving osmotic pressure balance, including interfacial tension. The motion of the solidification front is modeled based on the Wilson-Frenkel law. The single nuclei model is validated by considering various asymptotic limits, as well as by comparing the results to ones available in the literature. The multiple nuclei model allows, for the first time, for the careful computational investigation of the interaction between evolving nuclei. The preliminary comparison with and interpretation of data obtained on the International Space Station (available at psi.nasa.gov) as well as ground-based experiments, will be discussed.

Acknowledgment: This project is supported by the NASA Grant NNX16AQ79G.

DY 68.12 Thu 15:30 Poster A

Structure formation in 4M3H/2E1H mixtures at low temeprature — •Jennifer Bolle, Christian Sternemann, Christian Albers, Göran Surmeier, Fatima Mallal, Robin Sakrowski, and Metin Tolan — Fakultät Physik/DELTA, Technische Universität Dortmund, 44221 Dortmund, Germany

Monohydroxy alcohols (MAs) have been scrutinized as a model of hydrogen bonded fluids. These hydrogen bonds are essential for the microscopic structure and dynamics of water, aqueous solutions and alcohols [1]. MAs are supposed to form supramolecular structures via hydrogen bonding in the liquid phase. Dielectric spectroscopy studies suggest ringlike arrangements for 4-methyl-3-heptanol (4M3H) and chainlike structures in 2-ethyl-1-hexanol (2E1H) and indicate a structural crossover for 4M3H/2E1H mixtures with temperature [2]. We present X-ray diffraction measurements of $(2E1H)_x(4M3H)_{1-x}$ mixtures over a temperature range from 175K to 405K. The results point towards a change of the supramolecular structures indicated by analysis of the first diffraction peak.

[1] Kaatze, U., Behrends, R., and Pottel, R. "Hydrogen network fluctuations and dielectric spectrometry of liquids". In: Journal of Non-Crystalline Solids . (2002), 305(1), 19-28. [2] Bauer, S., Wittkamp, H., Schildmann, S., Frey, M., Hiller, W., Hecksher, T., and Böhmer, R. "Broadband dynamics in neat 4-methyl-3-heptanol and in mixtures with 2-ethyl-1-hexanol". In: The Journal of chemical physics. (2013), 139(13), 134503.

DY 68.13 Thu 15:30 Poster A

Concentration effects on the phase-behaviour and sheared dynamics of rod-like particles — •Pawel Mollenhauer, Henning Reinken, and Sabine H. L. Klapp — Institut für Theoretische Physik, Technische Universität Berlin, Berlin, Deutschland

Already in thermodynamic equilibrium, systems of rod-like particles show an interesting phase behavior, including isotropic–nematic phase coexistence. Driving such a system out of equilibrium by applying a shear flow results in a shift of the isotropic–nematic transition. Furthermore, sheared nematic liquid crystalline systems can show the formation of bands in the gradient and the vorticity direction [1]. These spatial patterns can additionally feature oscillatory orientational motion of the nematic director (e.g. tumbling or wagging) [2].

In this work, we apply the Doi-Hess-theory [3] that couples the tensorial nematic order parameter to the velocity field. In addition, we explicitly include the concentration dynamics using a DFT-approach bridging microscopic and mesoscopic levels [4]. Starting from an already phase-separated system we numerically investigate the spatiotemporal pattern formation under shear. In contrast to earlier works [5], we do not restrict our investigations to stationary states. Instead, we focus on oscillatory states and vorticity banding.

[1] P. Olmsted, Rheol. Acta **47**: 283 (2008).
[2] R. Lugo-Frías et al., Eur. Phys. J. E **39**: 88 (2016).
[3] S. Hess, Tensor for Physics, (2015).
[4] R. Lugo-Frías et al., J. Phys.: Condens. Matter **28**, 244022 (2016).
[5] P. Olmsted et al., Phys. Rev. E **60**, 4 (1999).

DY 68.14 Thu 15:30 Poster A

Elastic turbulence at low Reynolds numbers and its control — •Reinier van Buel, Christian Schaaf, Leander Rolef, and Holger Stark — Institut für Theoretische Physik, Technische Universität Berlin, Hardenbergstr. 36, 10623 Berlin, Germany

Viscoelastic polymer solutions have remarkable qualities compared to their Newtonian counterparts. Especially at very small scales, such as employed in microfluidic devices, they enhance mixing and heat

transfer. This is due to elastic turbulence [1], which bears the same qualities as inertial turbulence. The relevant dimensionless number for viscoelastic fluids is the Weissenberg number, which is the ratio of nonlinear stress to dissipation via linear stress relaxation. Plane Couette flows of viscoelastic fluids have been shown to exhibit an elastic subcritical instability at low Reynolds numbers whereas flows with curved stream lines are linearly unstable. The critical Weissenberg number is related to the curvature of the flow stream lines.

We report here on the onset of elastic turbulence in a two-dimensional Taylor-Couette geometry using numerical solutions of the Oldroyd B model as our constitutive equation. We observe a critical Weissenberg number that demarcates the transition from a stable to an elastic turbulent flow. We characterize the turbulent flow by observing a strong enhancement of flow resistance and a power-law decay of velocity power spectra, which show that the flow is activated on a broad range of temporal scales. Finally, we present first results on controlling the instability by using time-delayed feedback.

[1] A. Groisman and V. Steinberg, Nature 405, 53 (2000).

DY 68.15 Thu 15:30 Poster A

Scalable and fast heterogeneous molecular simulation with predictive parallelization schemes — •Horacio V Guzman, Torsten Stuehn, and Kurt Kremer — Max Planck Institute for Polymer Research, Ackermannweg 10, 55128 Mainz, Germany

Multiscale and inhomogeneous molecular systems are challenging topics in the field of molecular simulation. In particular, modeling biological systems in the context of multiscale simulations and exploring material properties are driving a permanent development of new simulation methods and optimizing algorithms. In computational terms, those methods require parallelization schemes that make a productive use of computational resources for each simulation and from its genesis. Here, we introduce the heterogeneous domain decomposition algorithm which is a combination of a heterogeneity sensitive spatial domain decomposition with an *a priori* sliding subdomain-walls procedure. The algorithm modeling is presented for dual resolution systems and inhomogeneous binary fluids, in terms of scaling properties as a function of the size of the low-resolution region and the high to low resolutions ratio. We also show the algorithm competences, by comparing it to its initial domain decomposition algorithms and dynamic load balancing schemes. Specifically, two representative molecular systems have been simulated and compared to the heterogeneous domain decomposition proposed in this work. These two systems comprise an adaptive resolution simulation of a biomolecule solvated in water and a phase separated binary Lennard-Jones fluid.

DY 68.16 Thu 15:30 Poster A

A transient amorphous solid formed from low density aqueous charged sphere suspensions — •Ran Niu[1], Sabrina Heidt[1,2], Ramsia Sreji[3], Riande Dekker[4], Maximilian Hofmann[1], and Thomas Palberg[1] — [1]Institute of Physics, Johannes Gutenberg University, D-55099 Mainz, Germany — [2]Graduate School Materials Science in Mainz, Staudinger Weg 9, D-55128 Mainz, Germany — [3]Department of Chemistry Physical and Biophysical Chemistry (PC III), Bielefeld University, D-33615 Bielefeld, Germany — [4]Debye Institute for Nanomaterials Science, Utrecht University, NL-3584 CC Utrecht, The Netherlands

We report the formation of a transient amorphous solid formed from charged polymer spheres suspended in thoroughly deionized water at volume fractions of 0.0002-0.01 [1]. From optical experiments, we observe the presence of short-range order and an enhanced shear rigidity as compared to the stable polycrystalline solid of body centred cubic structure. On a density dependent time scale of hours to days, the amorphous solid transforms into this stable structure. We further present preliminary dynamic light scattering data showing the evolution of a second slow relaxation process possibly pointing to a dynamic heterogeneity known from other colloidal glasses and gels. We compare our findings to the predicted phase behaviour of charged sphere suspensions and discuss possible mechanisms for the formation of this peculiar type of colloidal glass [2]. References 1.*T. Palberg, et al. J. Stat Phys. 2016, 074007 (2016). 2.*R. Niu, et al. Sci. Rep. accepted.

DY 68.17 Thu 15:30 Poster A

^{2}H and ^{17}O NMR studies of dynamics of water-ethylene glycol mixtures — •Verena Fella, Dominik Demuth, and Michael Vogel — TU Darmstadt, Condensed Matter Physics, Darmstadt, Germany

Binary water mixtures play an important role in biological as well as technological systems. Particularly water-alcohol mixtures are used in many applications though a complete understanding of their complex dynamical behaviour is still lacking. Here, nuclear magnetic resonance (NMR) experiments prove to be a powerful tool due to isotope selective measurements. ^{2}H NMR is an established method to analyse mixtures by deuterating one component. Unfortunately, selective observation of water in water-alcohol mixtures is hampered by deuteron exchange. Adjei-Acheamfour et al. (J. Chem. Phys., 143, 214201 (2015)) recently investigated ultraslow dynamics in ice with ^{17}O NMR by selective excitation of the central line. This approach yields many new possibilities to explore glass-forming materials. We combine ^{17}O and ^{2}H NMR to analyse a mixture of $H_2{}^{17}O$ and deuterated ethylene glycol (EG-d4) where each component can be measured separately. Correlation times τ in the range from 10^{-10} to 10^{-5} s show a strong coupling between the water and EG dynamics. For the supercooled phase the correlation times exhibit a broad distribution, so that ^{17}O NMR studies at $\tau > 10^{-5}$ s are limited by short spin-lattice relaxation times T_1. However, we show that ^{17}O NMR yields valuable insights into the crystalline phase of water-EG mixtures. In the future this can be exploited to study crystallisation in various aqueous systems.

DY 68.18 Thu 15:30 Poster A

The non-Gaussian parameter and breakdown of the Stokes-Einstein relation in supercooled liquids — •Lawrence Smith and Andreas Heuer — Institut für physikaliusche Chemie

Elementary units of a binary lennard-jones glassformer can be identified through quantitative analysis of its underlying potential energy landscape. These units can be fully understood within the continuous time random walk formalism and are found to contain the complete information concerning thermodynamics and diffusivity, while displaying finite size effects with respect to relaxation times and spacial correlations [1].

Previous research has shown that it is possible to identify major contributions to the non-Gaussian parameter as arising from the moments of the waitingtime distribution for jumps between metabasins of the potential energy landscape [2].

This work investigates the impact of coupling between these elementary units on spacial heterogeneity. By analysing the non-Gaussian parameter in molecular dynamics simulations as well as in a stochastic model we gain insight into the breakdown of the Stokes-Einstein relation and into the underlying lengthscales at play.

[1] C. Rehwald, A. Heuer, Phys. Rev. E 86, 051504 2012 [1] C. Schroer, A. Heuer, Phys. Rev. Lett. 110, 067801 2013

DY 68.19 Thu 15:30 Poster A

Nachweis des Debye-Prozesses in einem Monohydroxyalkohol mittels depolarisierter Lichtstreuung — •Andreas Helbling, Jan Gabriel, Florian Pabst, Till Böhmer und Thomas Blochowicz — TU Darmstadt, Institut für Festkörperphysik, 64289 Darmstadt

Lange Zeit wurde die Debye-Relaxation, die der langsamste dynamische Prozess in Monohydroxyalkoholen ist und deren Ursprung immer noch nicht vollständig verstanden ist, nur in der dielektriktrischen Spektroskopie beobachtet. Inzwischen konnte er jedoch auch mit anderen experimentellen Methoden, wie z.B. in mechanischen Scherexperimenten [1], nachgewiesen werden. Daher haben wir Photonen-Korrelations-Spektroskopie (PCS) an dem Monohydroxyalkohol 5-Methyl-2-Hexanol (5M2H) mit breitbandiger dielektrischer Spektroskopie (BDS) über einen weiten Temperatur- und Frequenzbereich verglichen. Zum ersten Mal konnten wir dabei den Debye-Prozess in einem Monohydroxyalkohol in der Lichtstreuung nachweisen. Der Vergleich seines Erscheinungsbildes in beiden Methoden erlaubt es uns aktuelle Modelle seines Ursprungs, wie zum Beispiel Rotationsbewegungen von wasserstoffbrückengebundenen Überstrukturen wie Ketten oder Ringe, zu testen.

[1] Gainaru C. et. al., Phys. Rev. Lett. 112, 098301 (2014)

DY 68.20 Thu 15:30 Poster A

Photometric far-field studies on luminescent borate glass ceramics for LED applications — •Juliane Schuppich[1], A. Charlotte Rimbach[1], Peter W. Nolte[2], Franziska Steudel[2], and Stefan Schweizer[1,2] — [1]South Westphalia University of Applied Sciences, Lübecker Ring 2, 59494 Soest — [2]Fraunhofer Application Center for Inorganic Phosphors, Branch Lab of Fraunhofer Institute for Microstructure of Materials and Systems IMWS, Lübecker Ring 2, 59494 Soest

The most common white light emitting diodes (LEDs) are based on a

blue-emitting LED chip coated with a yellow-emitting phosphor; the phosphor acts as a frequency-downshifter for a significant part of the blue light to generate white light. Luminescent glasses represent an interesting alternative to the commonly used phosphor/polymer composite due to their higher thermal and chemical stability. The glasses are optically activated by additional lanthanide ion doping. However, since the optical absorption coefficient of the lanthanide ions is low, the as-made glasses are processed to glass ceramics in a subsequent annealing step. The glass ceramics provide a longer optical path length for the incident blue light due to scattering at the grown crystallites in the glass. In this work, photometric far-field studies on europium-doped lithium borate glass ceramics are presented to show the potential of these systems as frequency-downshifter for LED applications. The experimental results are compared with optical simulations to optimize the glass ceramics with respect to lanthanide ion concentration, crystallite size distribution as well as degree of crystallization.

DY 68.21 Thu 15:30 Poster A

Dynamic glass transition in the supercooled liquid and plastic crystal of ethanol — •Yeong Zen Chua[1], Amanda R. Young-Gonzales[2], Ranko Richert[2], and Christoph Schick[1] — [1]Uni Rostock, Institut für Physik and Competence Centre CALOR, Rostock — [2]School of Molecular Sciences, Arizona State Uni, Tempe, Arizona, USA

Ethanol has been widely investigated and is well-known to exhibit a very interesting polymorphism of different solid phases: a fully-ordered (monoclinic) crystal, a (bcc) plastic crystal, a glassy plastic crystal and an ordinary amorphous glass. Physical vapor deposition (PVD) has been used to prepare amorphous glasses of ethanol, which upon heating to higher temperature transforms into the plastic crystal of ethanol. The dynamic glass transition of supercooled liquid of ethanol is successfully measured by AC nanocalorimetry. Preliminary results for the plastic crystal are also presented. With that, the frequency dependency of the dynamic glass transition of the supercooled liquid of ethanol is measured and compared with published dielectric data. Comparison of dielectric data of supercooled liquid of ethanol with AC nanocalorimetric data shows that ethanol exhibits Debye peak, which cannot be observed in AC nanocalorimetry. In previous published dielectric data, the prominent Debye peaks have been mistaken as structural α relaxation. The dielectric data have been re-evaluated and the high frequency wing in the dielectric spectra is identified as the structural α relaxation.

DY 68.22 Thu 15:30 Poster A

Cogging free magnetic gears — Stefan Borgers, Simeon Völkel, Stefan Hartung, Wolfgang Schöpf, and •Ingo Rehberg — Experimentalphysik V, Universität Bayreuth

The coupling of two rotating spherical magnets is investigated experimentally, with particular emphasis on those motions where the driven magnet is phase-locked to the driving one, which is a feature of the so called cogging free couplings. The theory for these experiments is based on pure dipole-dipole interaction. Technical applications of this kind of coupling are foreseeable particularly for small machines.

DY 68.23 Thu 15:30 Poster A

Nanostructured titania templated by amphiphilic diblock copolymer for lithium-ion battery anodes — •shanshan yin, Peter Müller-Buschbaum, and lin song — TU München, Physik-Department, LS Funktionelle Materialien, 85748 Garching

Lithium-ion batteries (LIBs) have been widely used in many aspects of modern life. Compared with conventional graphite anodes, titania possesses higher capacity and better operation safety, which makes it a promising substitute to the commonly used graphite anodes. However, problems such as gradual capacity decay and relative high intercalation potential hinder its practical application. It has been reported that nanostructured titania can efficiently improve the electrochemical performance. Therefore, in this work titania nanostructures are prepared via sol-gel synthesis in combination with the amphiphilic diblock copolymer poly(styrene-block-ethylene oxide) (PS-b-PEO) as structure-directing agent. The morphology of the obtained titania nanostructures is studied with optical microscopy (OM) and scanning electron microscopy (SEM), while the optical properties are investigated with UV/Vis spectroscopy and Photoluminescence (PL).