Aktuelle Veranstaltungen

Kolloquium

Thema: **Challenges and solutions for electron microscopy and spectroscopy in the field of chemical energy conversion**

Datum: 30.05.22

Uhrzeit: 16:15

Ort: H6 & online

Vortragender: Dr. Walid Hetaba

MPI für Chemische Energiekonversion, Mülheim a.d.R

Inhalt: Analytical transmission electron microscopy (TEM) has become a widely implemented technique in a modern research institute involved in catalysis and materials science which are key topics in the field of chemical energy conversion. To get the full picture when investigating different materials and their properties, several analytical techniques available in TEM have to be combined and compared with the results of other analytical instruments. However, usually TEM specialists perform the necessary tasks for a thorough microscopical study of the materials of interest. The need for generating standard procedures and workflows optimized for non-expert TEM users has been addressed in our ChemiTEM project. The developed workflows were implemented into a tablet app enabling non-expert TEM users to perform even applications they have no previous experience with by guiding them through all necessary decision processes. The app also includes a workflow for data analysis. All this renders the set of standardized workflows a versatile toolbox for TEM applications in material synthesis and chemistry. In many cases, samples have to be investigated under inert conditions, e.g., when catalysts consist of reduced metals. We developed a new method to perform such investigations without the necessity to use dedicated sample holders but instead being able to harness the capabilities of standard sample holders. I will present some examples of the interplay of different analytical techniques as well as results of the ChemiTEM project and our inert investigation techniques. In addition, a short outlook on the development of standardized workflows for electron energy-loss spectrometry (EELS) and X-ray photoelectron spectroscopy (XPS) will be given.

Ansprechpartner: A. Hütten

Kolloquium Mathematische Physik

Thema: **tba**

Datum: 03.06.22

Uhrzeit: 16:15

Ort: V4-119

Vortragender: Elena Vedmedenko

University of Hamburg

Inhalt:

Ansprechpartner: M. Baake

Seminar Hochenergiephysik

Thema: **tba**

Datum: 30.06.22

Uhrzeit: 14:15

Ort: D6-135

Vortragender: Simona Procacci

Universität Bern

Inhalt:

Ansprechpartner: D. Bödeker

Seminar Kondensierte Materie

Thema: **14.00 Probing and utilizing spin-electric couplings in molecular magnets**

Datum: 03.06.22

Uhrzeit: 14:00

Ort: ZOOM / Konferenzschaltung

Vortragender: Jakub Mrozek

University of Oxford, now Helsinki

Inhalt: Molecular magnets have been demonstrated as promising candidates for quantum-coherent nanodevices, due to their long relaxation times and design flexibility. They are most typically investigated and operated using Electron Paramagnetic Resonance. However, relying only on the intrinsic coupling between their spins and the magnetic field while building quantum presents a challenge, as magnetic fields, unlike electric fields, are not easily constrained to required length scales. Using modified Hahn echo microwave pulse sequences incorporating static electric fields, we investigated electric field sensitivity and its origins in several molecular magnets, such as Cu3 frustrated triangles[1], Cr7Mn rings [1], and HoW10 crystals[2][3], aiming to find the key to the design of a magnetic molecule that may be operated with electrical means. We discover couplings sufficient to use an electric field to address subpopulations of molecular spins by modifying their operating frequencies and demonstrate such selection experimentally. [1] J. Liu, J. Mrozek et al., Phys. Rev. Lett 2019, 122, 037202 [2] J. Liu, J. Mrozek et al., Nature Physics 2021, 17, 1205–1209 [3] M. Shiddiq et al., Nature 2016 531, 348–351

Ansprechpartner: Jürgen Schnack

Seminar Mathematische Physik

Thema: **Many-particles diffusing with resetting: study of the large-deviation properties of the flux distribution**

Datum: 05.05.22

Uhrzeit: 16:00

Ort: D5-153

Vortragender: Costantino Di Bello

Inhalt: In this paper we studied a model of noninteracting particles moving on a line following a common dynamics. In particular we considered either a diffusive motion with Poissonian resetting, and a run-and-tumble motion with Poissonian resetting. We were interested in studying the distribution of the random variable Q_t defined as the flux of particles through origin up to time t. We used the notation $P(Q,t)$ to identify the probability $\mathbb{P}\{Q_t=Q\}$. We considered particles initially located on the negative half line with a fixed density ρ. In fully analogy with disordered systems, we studied both the annealed and the quenched case for initial conditions. In the former case we found that, independently from the specific dynamics, $P_\mathrm{an}(Q,t)$ has a Poissonian shape; while in the latter case, for what concerns the diffusive dynamics with resetting, the large deviation form of the quenched distribution reads $P_\mathrm{qu}(Q,t)\sim \exp\left[-r^2t^2 \Psi_\mathrm{diff}\left(\dfrac{Q}{\rho t}\right)\right]$ with the large deviation function $\Psi_\mathrm{diff}(x)$ exhibiting a discontinuity in the third derivative, hence aiming, despite the simplicity of the model, at the exhistence of a dynamical phase transition. The quenched distribution for the run-and-tumble dynamics, instead, does not exhibit any kind of phase transition. Importance sampling Monte Carlo simulations were performed to prove the analytical results. References: Current fluctuations in noninteracting run-and-tumble particles in one dimension Tirthankar Banerjee, Satya N. Majumdar, Alberto Rosso, and Grégory Schehr, Phys. Rev. E 101, 052101 https://doi.org/10.1103/PhysRevE.101.052101 Current Fluctuations in One Dimensional Diffusive Systems with a Step Initial Density Profile B. Derrida and A. Gerschenfeld, J. Stat. Phys. 137, 978 (2009) https://doi.org/10.1007/s10955-009-9830-1

Ansprechpartner: Gernot Akemann

Seminar Bielefeld-Melbourne Zufallsmatrizen

Thema: **Universal Cutoff for Dyson Ornstein Uhlenbeck Process**

Datum: 01.06.22

Uhrzeit: 09:00

Ort: ZOOM / Konferenzschaltung

Vortragender: Djalil Chafaï

Université Paris Dauphine

Inhalt:

We study the Dyson-Ornstein-Uhlenbeck diffusion process, an evolving gas of interacting particles. Its invariant law is the beta Hermite ensemble of random matrix theory, a non-product log-concave distribution. We explore the convergence to equilibrium of this process for various distances or divergences, including total variation, relative entropy, and transportation cost. When the number of particles is sent to infinity, we show that a cutoff phenomenon occurs: the distance to equilibrium vanishes at a critical time. A remarkable feature is that this critical time is independent of the parameter beta that controls the strength of the interaction, in particular the result is identical in the non-interacting case, which is nothing but the Ornstein-Uhlenbeck process. We also provide a complete analysis of the non-interacting case that reveals some new phenomena. Our work relies among other ingredients on convexity and functional inequalities, exact solvability, exact Gaussian formulas, coupling arguments, stochastic calculus, variational formulas and contraction properties. This work leads, beyond the specific process that we study, to questions on the high-dimensional analysis of heat kernels of curved diffusions.

Ansprechpartner: Anas Rahman