DF 6 Glass II (together with division 'Dynamics and Statistical Physics' [DY])

Time: Tuesday 14:30–16:10 Room: MÜL Elch

DF 6.1 Tue 14:30 MÜL Elch

Indications for a slow β-relaxation by mechanical spectroscopy of a strong and a fragile metallic glass — •Jörg Hachenberg, Annelen Kahl, and Konrad Samwer — 1. Physikalisches Institut, Universität Göttingen, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany

Mechanical spectroscopy is used to investigate the elastic properties of the strong metallic glass former $Zr_{65}Al_{7.5}Cu_{27.5}$ and the fragile $Pd_{77}Cu_6Si_{17}$. The dynamic mechanical analyser is used to measure the complex elastic modulus of melt spun bands in the low Hz regime while the double-paddle oscillator is applied for thin films at 5.4 kHz. In the vicinity of glass-transition, the α-relaxation is fitted using a Havriliak-Negami function in temperature domain. The measured data clearly deviate from the model for both metallic glasses. An explicit misfit on the low temperature flank, also termed excess wing, is interpreted as an underlying, merged slow β-relaxation. Our experimental results provide evidence that this secondary relaxation, existing in both strong and fragile amorphous metals, can be regarded as a universal property of glasses and is compared with recent MD-simulations by H. Teichler et al.

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DF 6.2 Tue 14:50 MÜL Elch

Sculpting the free energy landscape — •Timo Aspelmeier[1], R. A. Blythe[2], A. J. Bray[3], and M. A. Moore[3] — [1]Institut für Theoretische Physik, Universität Göttingen — [2]School of Physics, University of Edinburgh, UK — [3]School of Physics and Astronomy, University of Manchester, UK

The free energy landscape of the Ising spin glass is analysed using the TAP equations. It is found that local minima of the free energy and saddles always occur in pairs, and that the saddles always have exactly one unstable direction. We show that local minima, which are usually very hard to find numerically, can be found in abundance using an iterative algorithm which operates "on the edge of chaos". We compare these results with the free energy landscape generated by the naive mean field equations of the spin glass and show that despite identical groundstates the free energy landscape at finite temperatures is fundamentally different from the TAP landscape.

DF 6.3 Tue 15:10 MÜL Elch

Dynamic critical behaviour in Ising spin glasses — •Michel Pleimling[1], Malte Henkel[2], and Ian Campbell[3] — [1]Institut für Theoretische Physik I, Universität Erlangen-Nürnberg, Germany — [2]Laboratoire de Physique des Matériaux, Université Henri Poincaré Nancy I, France — [3]Laboratoire des Colloïdes, Verres et Nanomatériaux, Université Montpellier II, France

The non-equilibrium ageing behaviour of critical Ising spin glasses with Bimodal, Gaussian, and Laplacian interaction distributions is studied numerically in three and four dimensions. The same phenomenology of the time-dependent scaling as in non-disordered magnets is found. Our data strongly indicate that the values of the non-equilibrium exponents and of the critical limit fluctuation-dissipation ratio depend on the distribution of the coupling constants.

[1] M. Pleimling and M. Henkel, Europhys. Lett. 69, 524 (2005)
[2] M. Pleimling and I.A. Campbell, to appear in Phys. Rev. B (cond-mat/0506795)

DF 6.4 Tue 15:30 MÜL Elch

Dynamics of mobile particles in an immobile environment: Computer simulations of disparate-sized mixtures — •Jürgen Horbach and Norio Kikuchi — Insitut für Physik, Johannes-Gutenberg-Universität Mainz, Staudinger Weg 7, 55099 Mainz

Molecular dynamics computer simulations are used to study transport properties of mobile particles in an immobile environment. To this end, we consider simple binary mixtures. The first system consists of small and big soft spheres in two dimensions where the big spheres are a factor of 5 bigger than the small ones. We discuss whether the transport properties are similar to those obtained from mode coupling theory [1]. The second system contains also small and big particles with a size–ratio 1:5. But now a three–dimensional system is considered where the particles interact via a screened Coulomb (or Yukawa) potential (note, that this system can be realized experimentally [2]). Here, a transition is observed where the big particles crystallize while the small particles remain in a kind of fluid phase. We study the activated transport of the small particles in the crystalline matrix.

[1] J. Bosse and Y. Kaneko, Prog. Theoret. Phys. Suppl. **126**, 13 (1997); Phys. Rev. Lett. **74**, 4023 (1995).
[2] A. Imhof and J.K.G. Dhont, Coll. Surf. A **122**, 53 (1997); Phys. Rev. E **52**, 6344 (1995); Phys. Rev. Lett. **75**, 1662 (1995).

DF 6.5 Tue 15:50 MÜL Elch

The m-component spin glass on the Bethe lattice — •Axel Braun and Timo Aspelmeier — Institut für theoretische Physik, Universität Göttingen

We investigate the m-component vector spin glass on the Bethe lattice in the limit $m \to \infty$. This is done analytically via the cavity method on a replica symmetric level. We exhibit a phase transition and calculate the critical temperature. Furthermore we confirm numerically the condensation of the lattice spins into a subspace in the groundstate (generalized Bose-Einstein condensation). The dimension n_0 of this subspace is proportional to N^μ, where N is the number of spins and μ is an exponent less than 2/5. This result is compared to the fully connected, the 2-d and the 3-d m-component spin glass.