CPP 35: Poster: Glasses and Glass Transition

Time: Wednesday 17:30–19:00 Location: Poster B2

CPP 35.1 Wed 17:30 Poster B2

Glass Transition and Crystallization of n-Alcohols Confined in Silicon Nano-Channels — •René Berwanger, Christoph Schumacher, and Rolf Pelster — FR 7.2 - Experimentalphysik, Universität des Saarlandes, D-66123 Saarbrücken, Germany

We present the investigation of several n-alcohols (C_4H_9OH-$C_{16}H_{33}OH$) in mesoporous silicon and silicon oxide by infrared and dielectric spectroscopy. The temperature of the liquid-solid phase transition and the structure of the solid phase depend on both the chain length and the radius of the pores (r = 3 nm-7 nm).
Long-chain alcohols exhibit a crystalline structure at low temperatures. In confinement this is an orthorhombic β-form, where the molecule axes are perpendicular to the pore axis, while in the bulk state a poly-crystalline structure of orthorhombic β- and monoclinic γ-form is observed[1]. In addition, confinement yields to a lowering of the transition temperatures of the liquid → Rotator-(II)-phase (R_{II}) and R_{II} → crystalline phase. On the other hand, short-chain alcohols in narrow pores (r ≈ 3nm) form a glassy state at low temperatures, but crystallize in larger pores.
[1] R. Berwanger, A. Henschel, P. Huber, K. Knorr, R. Pelster, Phys. Rev. B, 79, 125442 (2009)

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Structural Relaxation in Disordered Solids Below T_g: Study by Thermal-Cycling Single-Molecule Spectroscopy — Yuri G. Vainer[1], Ivan Yu. Eremchev[1], Andrei V. Naumov[1], and •Lothar Kador[2] — [1]Institute for Spectroscopy, Russian Academy of Sciences, Troitsk, Moscow Reg., 142190, Russia — [2]University of Bayreuth, Institute of Physics and Bayreuther Institut für Makromolekülforschung (BIMF), 95440 Bayreuth, Germany

Structural relaxation processes in disordered solids have been studied between 4.5 K and the glass transition with single-molecule spectroscopy and thermal-cycling experiments. The investigated systems are the amorphous polymer polyisobutylene (PIB) doped with a substituted terrylene (TBT) and the disordered crystal *ortho*-dichlorobenzene (*o*-DCB) doped with terrylene (Tr). Irreversible changes of single-molecule spectra were observed and attributed to relaxation processes in the local environment of the chromophore molecules. The effects of these processes on the individual parameters of low-energy excitations in the glass matrix (two-level systems and quasi-localized low-frequency vibrational modes) were analyzed as a function of temperature for the system TBT/PIB. Surprisingly, a large number of relaxation processes take place far below T_g. The data indicate also that the activation energies of the relaxations are distributed non-uniformly in space.

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Signatures in glassy dynamics of molecular liquids and polymers — •Tilman Schubert, Joshua Sangoro, Ciprian Iacob, and Friedrich Kremer — Institute of Experimental Physics I, University of Leipzig, Linnést. 5, 04103 Leipzig, Germany

Charge transport and glassy dynamics in a variety of amorphous materials are investigatet by Broadband Dielectric Spectroscopy (BDS). Despite the apparently similar Vogel - Fulcher - Tamann - type thermal activation of the characteristic quantities (structural alpha-relaxation rate, diffusion rate and dc conductivity), significant discrepancies are revealed upon application of a model-free derivative technique. Detailed analysis of the dielectric strength and the type of its temperature dependence shows distinct characteristics caused by the differences in the type of molecular interactions involved in the materials studied.