DF 17: Glasses III (joint session with CPP, DY)

Time: Wednesday 12:30–13:10 Location: H11

DF 17.1 Wed 12:30 H11

Nonlinear dielectric response of glass-forming systems — •Thomas Bauer, Peter Lunkenheimer, Stefan Kastner, and Alois Loidl — Experimental Physics V, Center for Electronic Correlations and Magnetism, University of Augsburg, 86135 Augsburg

In the present contribution, we report a thorough investigation of Type A and other glass-forming liquids by nonlinear dielectric spectroscopy. This is done by comparing and quantifying the difference of high- and low-field permittivity as well as by the determination of higher harmonics after applying a high ac field up to 849 kV/cm. In earlier works [1,2], a strong increase of the dielectric loss was found at the high-frequency flank of the α-relaxation peak while the field dependence was negligible at low frequencies. This finding is consistent with the box model, assuming correlated dielectric and thermal relaxation times within dynamical heterogeneities. We show measurements extending into the frequency region of the so-called excess wing that indicate a complete lack of this nonlinear effect for this spectral feature. In addition, we report the higher-order response of glycerol and propylene carbonate for a broad temperature range and various electric fields. The third-order susceptibility shows a significant hump, that can be ascribed to molecular correlations [3] and cannot be explained by trivial saturation effects of the dipolar polarization, known since long.

[1] R. Richert and S. Weinstein, Phys. Rev. Lett. **97**, 095703 (2006).
[2] L.-M. Wang and R. Richert, Phys. Rev. Lett. **99**, 185701 (2007).
[3] C. Crauste-Thibierge, C. Brun, F. Ladieu, D. L'Hôte, G. Biroli, and J-P. Bouchaud, Phys. Rev. Lett. **104**, 165703 (2010)

DF 17.2 Wed 12:50 H11

Pressure dependent void size in SiO_2 investigated with the Pulsed Low Energy Positron System (PLEPS) — •Luca Ravelli[1], Werner Egger[1], Marco Zanatta[2], Roberto Sennen Brusa[2], and Günther Dollinger[1] — [1]Universität der Bundeswehr, München, Germany — [2]Università di Trento, Trento, Italy

Positron annihilation lifetime spectroscopy (PALS) is a very powerful tool for the non-destructive detection and characterization of open volume defects such as vacancies, vacancy clusters and voids in different materials, ranging from metals to semiconductors and insulators. In combination with a mono-energetic pulsed beam of variable energy it is possible to tune the positron implantation depth. The analysis of the lifetime spectra as a function of the implantation energy allows to measure defect depth profiles from the surface to the bulk of the sample.

As an example we show a study of the evolution of defects, and in particular of voids, present in SiO_2 glasses compressed with 0, 2, 4, 6 and 8 GPa. Because of the small size and the shape of the samples (small cylinders with diameter from 3 mm for the reference sample to 2 mm for one subjected to the highest pressure) a conventional positron lifetime measurement in sandwich configuration was impossible. The measurements were performed with the Pulsed Low Energy Positron System (PLEPS) at the high intensity positron source NEPOMUC (NEutron-induced POsitron source MUniCh) at the research reactor FRM-II. The results have shown a decrease of the void-size with increasing pressure.