



	Experiment title: Study of the infinite frequency sound velocity and the dynamic structure factor in salol by inelastic X-ray scattering	Experiment number: HS-1316
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Report:

Utilizing very high energy resolution x-ray scattering we studied the temperature dependence of the infinite frequency sound velocity $C_{\infty}(q,T)$ in Salol in the temperature range from 55 to 355 K thus covering temperatures from very deep in the glass to far above the glass transition temperature T_g (=218K). Four selected spectra are shown in Fig. 1 at $q = 2 \text{ nm}^{-1}$. We investigated possible discontinuities of the energy shift of the observed phonon at the temperatures T_g , T_c (=265K) and T_A (=348K). Indeed a break in temperature behaviour of the position and of the width or damping of the phonons are observed at T_g as depicted in Figs. 2 and 3 respectively. In contrast to findings in the hydrogen bonded glass forming liquid Glycerol by Masciovecchio et al. (Exp. rep. HS-81) a change of slope at T_c is not observed but we see a so far not understood feature in the position of the phonons.

The broadening of the phonon with a maximum at around 300 K points at an interrelation of this excitation with a relaxation.

We were due to experimental difficulties not able to cover the temperature range extending beyond T_A . Further investigations with this methods are desirable to be able

to look at the complete picture of the evolvment of the inelastic excitations with temperature and to relate the findings to current models of the glass transition.

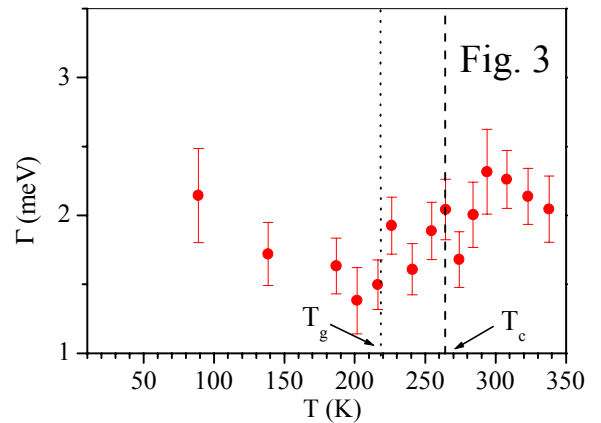
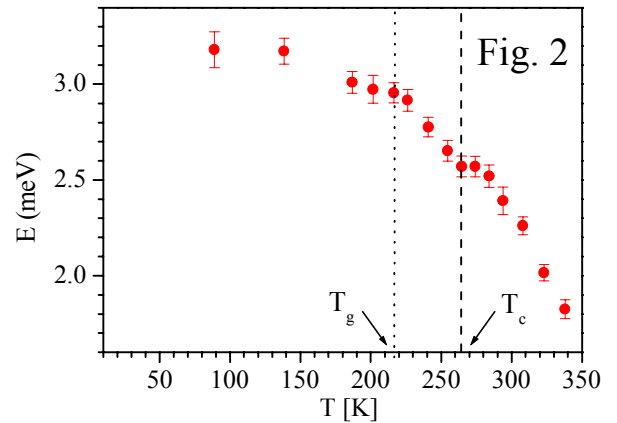
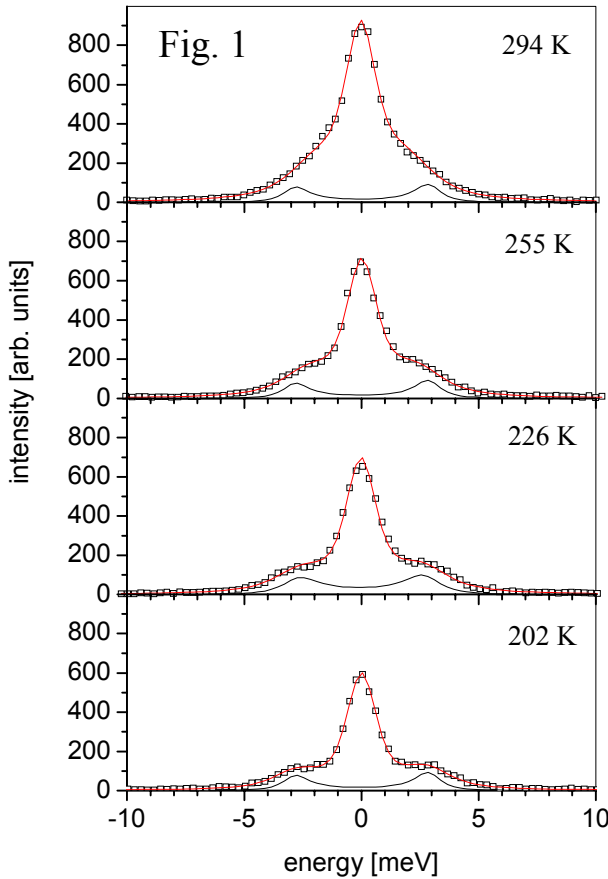


Fig. 1: Temperature dependence of inelastic X-ray spectra of Salol at selected temperatures. The full line through the data points represents the best fit using the DHO model convoluted with the resolution function. The resulting phonons are plotted additionally.

Fig. 2: Energy shift of the phonon lines measured at different temperatures at $q = 2 \text{ nm}^{-1}$. The dotted line indicates the position of T_g . A clear change in the slope is visible at this temperature. The dashed line marks the position of T_c and a so far not observed feature emerges at and above this temperature.

Fig. 3: Temperature dependence of the width of the phonon line of Salol at $q = 2 \text{ nm}^{-1}$. Again the dotted line stands for T_g and the dashed one for T_c . A change of temperature dependence is observed at T_g and no peculiarities at T_c . A peak is developing towards higher T .