ESRF	Experiment title: Study of beta relaxation in o-terphenyl by very high resolution inelastic x-ray scattering	Experiment number: HS-203
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Shifts: 21	Local contact(s): F. Sette	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

C. Masciovecchio, ESRF, BP 220 F-38043 Grenoble, Cedex France
G. Monaco, University of L'Aquila, I-67100 L'Aquila, Italy
M. Soltwisch, Freie Universitat Berlin, D-14195 Berlin, Germany

Report:

The dynamic structure factors of two glass former: o-terphenyl and glycerol have been measured at different temperatures T and momentum exchanged Q using inelastic x-ray scattering with very high resolving power. We have found propagating excitations in both liquid and glass phases as can be seen in Fig. 1 for glycerol. This result shows ***that*** the dynamics at high firequency ***is the continuation*** of the acoustic branch detected with ultrasounds and Brillouin light scattering techniques.

The measured excitation energy at fixed exchanged momentum shows a cusp like behavior at a temperature inferred to be higher than the macroscopic structural arrest temperature T_g (usually called the calorimetric glass transition temperature). In Fig. 2 is reported such a result for the two samples. The indicated temperature T_x is the temperature at which we observe a change in slope of the sidebands peak position. This result suggest that the structural arrest take place at the **molecular** scale at temperatures higher than for macroscopic diffusion.

Using the $Q \rightarrow 0$ limit of few dispersion curves we have developed a scheme to extract the infinite **frequency** speed of sound velocity C,(T) for glycerol. The derived values of $C_\infty(T)$ are in disagreement with previous determinations obtained by extrapolating low frequency data. In Fig. 3 are reported measurements of the speed of sound performed by Brillouin light scattering (BLS) and inelastic x-ray scattering (IXS). Two low frequency extrapolation of the infinite **frequency** speed of sound are also reponed in the figure (EXTRl and EXTR2). The results shown have been subject of three different papers [I ,2,3].

[l] C. Masciovecchio et al., accepted on Phys. Rev. Len.
[2] C. Masciovecchio et al., accepted on Phyl. Mag.
[3] G. Monaco et al.. in preparation

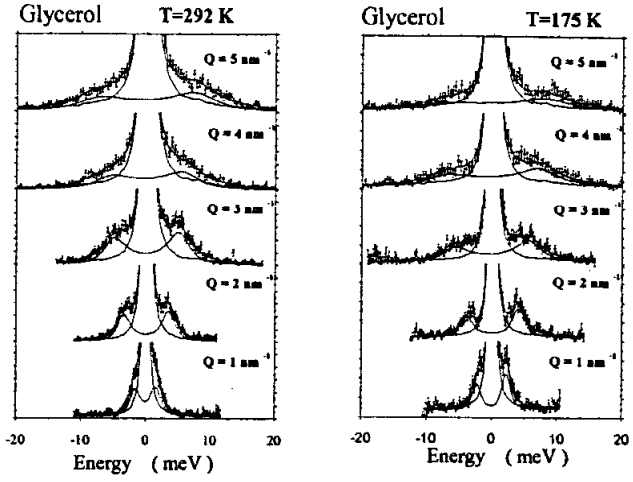

Fig. 1 - IXS spectra of glycerol taken above and below the calorimetric glass transition temperature (186 K).

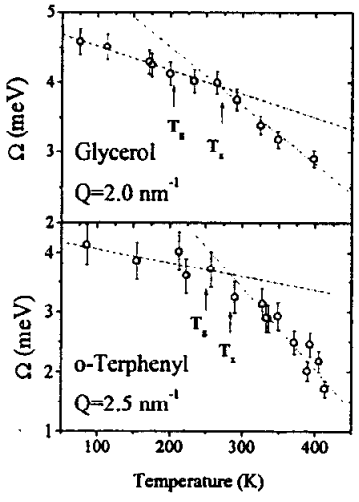

Fig. 2 - Inelastic peak position as function of temperature.

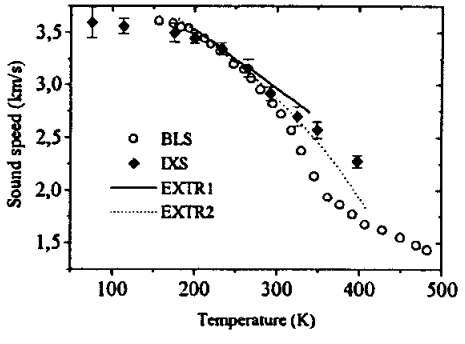

Fig. 3 - Speed of sound of glycerol measured by BLS and IXS.