ESRF	Experiment title: STUDY OF INFINITE FREQUENCY SOUND VELOCITY IN GLYCEROL BY VERY HIGH RESOLUTION INELASTIC X-RAY SCATTERING	Experiment number: HS-81
Beamline: ID16	Date of Experiment: from: 13/08/96 to: 26/08/96	Date of Report:
Shifts: 21	Local contact(s): F. SETTE	*Received at ESRF:*

Names and affiliations of applicants (*indicates experimentalists):

C. MASCIOVECCHIO ESRF

G. MONACO L'AQUILA ITALY

M. SOLTWISCH BERLIN GERMANY

Report:

Inelastic x-ray scattering proved to be a powerful tool to explore the high frequency collective dynamics in disordered systems. The spanned $Q-\omega$ region is important for the study of the complex structural relaxation pattern of glassformers. As predicted by the recent mode coupling theory (MCT), this relaxation pattern should show a two step-structure (the so called α and β relaxation processes).

Using very high energy resolution x-ray scattering, in the experiment HS -81 we determined the infinite frequency sound velocity $C_\infty(Q,T)$ in glycerol to investigate on the possible existence of a fast relaxation process. $C_\infty(Q,T)$ has been obtained from the dispersion relation of acoustic like excitations measured as a function of temperature from the liquid to the glass state.

Our results allow to establish the following points:

i) In glasses, in spite of the lack of translational invariance, we confirm the existence of a propagating dynamics. Moreover the Boson ***Peak,*** **a** feature typically observed in glasses by incoherent neutron scattering and Raman light scattering, is related to the observed acoustic-like propagating dynamics and not to localized excitations.

ii) In the liquid and in the glass, the observed speed of sound is consistent with the extrapolation of light scattering experiments (see Fig.1). This imply the absence of a β relaxation process.

iii) The observed phonon-like excitations have a damping much larger than the extrapolation at large Q of the corresponding parameters observed in the hydrodynamic limit. This may imply a structural contribution to the excitations width.

A scientific publication is being prepared.

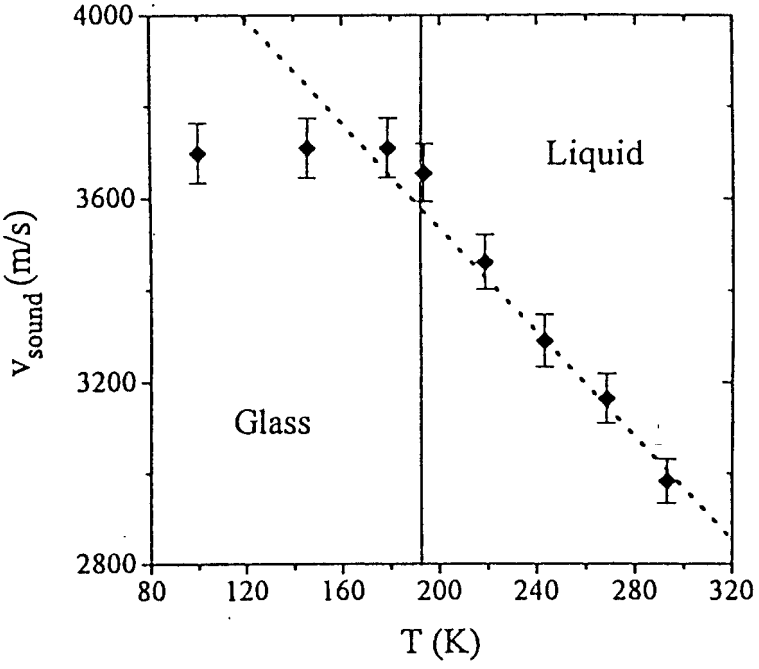

FIG. 1 - The speed of sound as function of temperature. The solid line indicates the liquid glass transition temperature while the dashed one is the extrapolated law for the speed of sound in the very high frequency limit.