ESRF	**Experiment title:** Role of the disorder in the high frequency dynamics of plastic crystals: the case of o-carborane	**Experiment number**: HS-2667
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Names and affiliations of applicants (* indicates experimentalists):

R. Angelini – University "La Sapienza" of Roma – Italy
T. Scopigno – University "La Sapienza" of Roma – Italy

Report:

Since it was not possible to buy o-carborane we studied the dynamic structure factor $S(Q,\omega)$ of the plastic crystal 1-cyanoadamantane ($C_{11}H_{15}N$) as a function of temperature and momentum in the energy range -25 ÷25 meV. We investigated five temperatures and exactly T = 100K, 130K, 150K, 293K, 300K; At room temperature the system is a plastic crystal with the molecules ordered in a fcc lattice site and the orientations dynamically disordered. If cooled fast enough, below the glass transition temperature (T_g=177K), the system undergoes a glass transition and becomes an orientational glass with molecules having disordered orientations completely "frozen".

In Fig.1 we report a sample of the measured spectra in the low Q region and exactly for Q comprised between 1.5 and 6.5 nm^{-1} and at two temperatures: T = 100 K in the orientational glass and T = 293K in the plastic crystal. A preliminary analysis of the spectra has been done by fitting the data with a Lorentzian for the central line and a damped harmonic oscillator (DHO) for the inelastic part. The resulting line-shapes are superimposed to the data. The quasi-elastic and inelastic contributions of the best fit are individually shown. In Fig.2 the energy position of the inelastic peaks $\Omega(Q)$, the apparent sound velocity $c(Q)=\Omega(Q)/Q$ and the width $\Gamma(Q)$ of the inelastic peaks have been plotted as a function of Q in the range 1.5÷6.5 nm^{-1}.

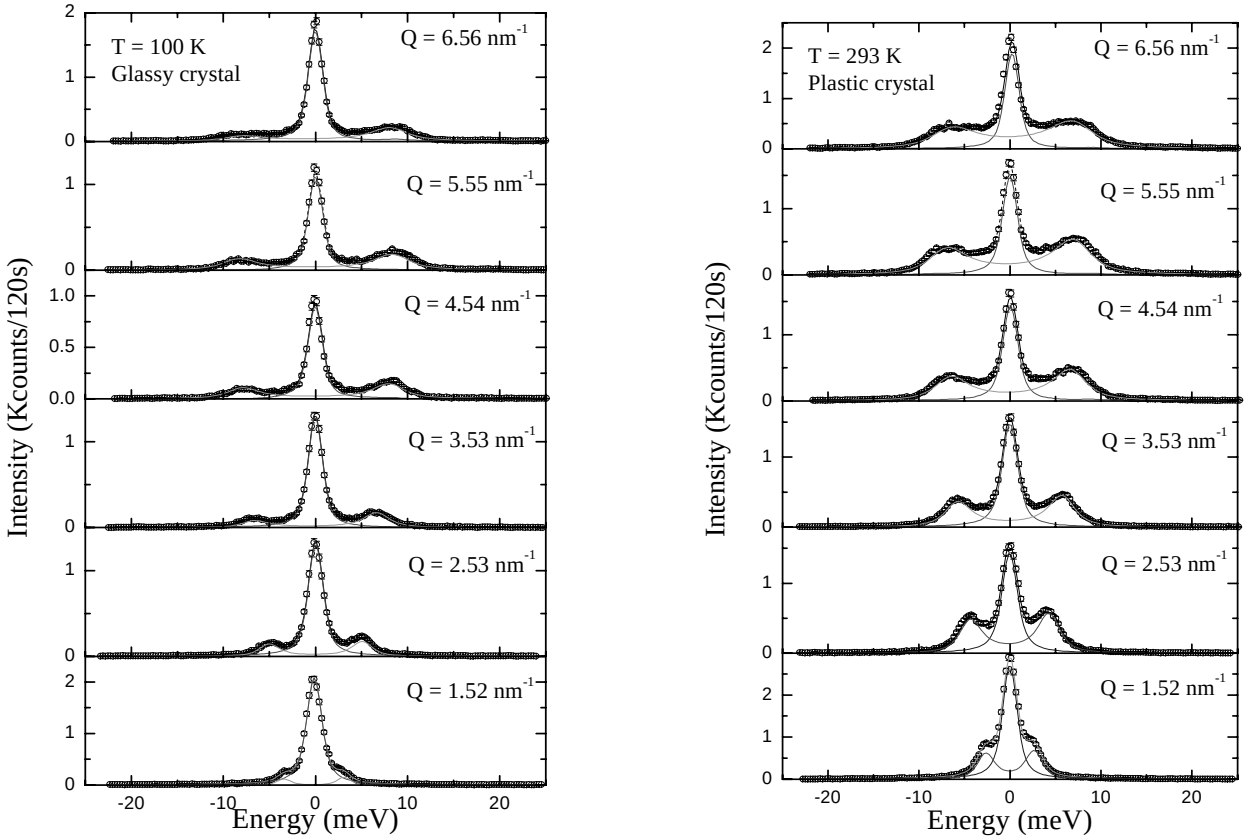

Fig.1: Example of the measured IXS spectra of 1-cyanodamantane at the indicated Q values and temperatures in two distinct phases: the orientational glass (T = 100 K) and the plastic crystal (T = 293K). The fits are superimposed to the data together with the elastic and inelastic contributions individually plotted.

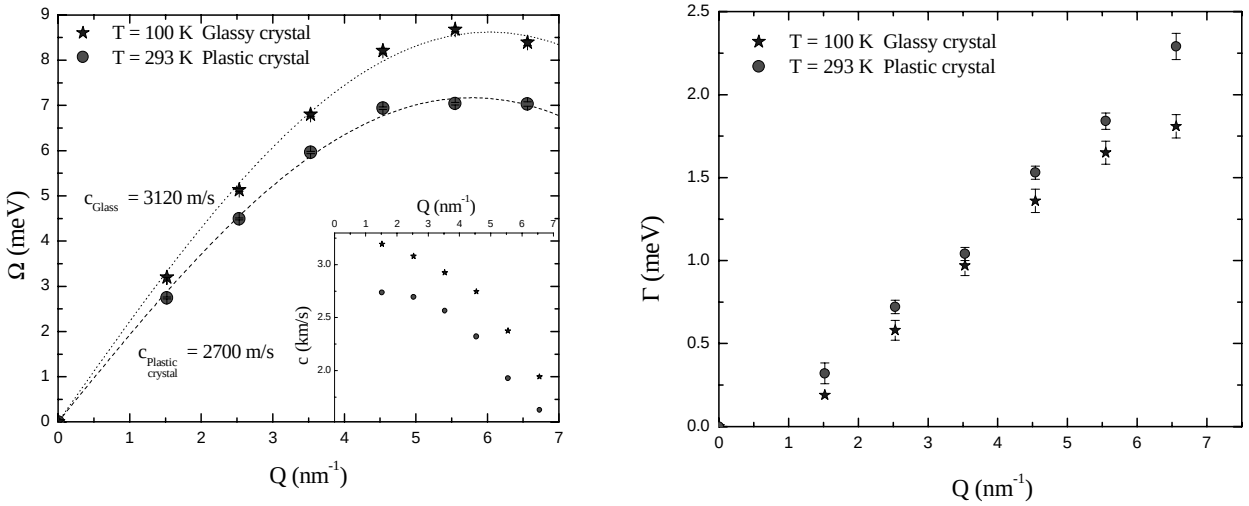

Fig.2: Left: dispersion curves at the two investigated temperatures. The dotted lines are the best fits to the data through sine functions. In the inset the apparent sound velocity $c(Q)=\Omega(Q)/Q$ is reported as a function of Q. Right: Q dependence of the width $\Gamma(Q)$ of the inelastic peaks.