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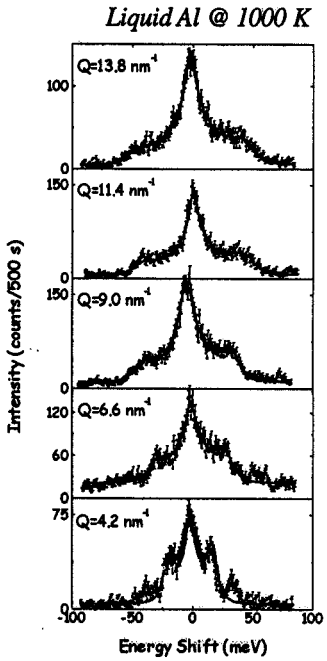
Report:

We used IXS to measure the dynamic structure factor of liquid aluminum at its melting point temperature. Thanks to the high resolution achievable at ID16, we have been able to perform the first detailed lineshape analysis on this system: we collected fixed-Q scan at more than twenty values with an energy resolution of 3meV.

The obtained results allow to investigate merits and drawbacks of the simple viscoelastic approach, commonly used to analyze neutron scattering experiment and molecular dynamic simulations on alkali metals. In this respect IXS plays in fact a privileged role: there are no kinematic restrictions limiting the accessible (E,Q) space and no incoherent contribution to the cross-section as in the case of neutrons, and the results are not affected by the necessary a priori guess about suitable interatomic potential as in the case of numerical simulations.

The raw data show the presence of two time-scales, i.e. a double slope in the quasi-elastic part of the collected spectra: this confirms previous results on lithium. The inescapable conclusion we reached is that it is *necessary* to postulate the presence of a secondary relaxation mechanism beside the single "shear relaxation" described by the viscoelastic model. The nature of this secondary mechanism is still an open issue and further investigations are required, devoted in particularly to the temperature behavior of the spectra in a wider temperature range above the melting point.

We report below a strip of spectra collected at 1000 K.
From the fit, it has been possible to extract significant physical parameters such as the two relaxation times, the strenght of the relaxations and the sound velocity at this temperature.
Positive dispersion of the latter quantity has been observed, confirming the results of previous theoretical speculations. Anyway it seems that the origin of such dispersion has to be ascribed to the fast relaxation mechanism rather than to the shear mechanism as the simple viscoelastic model would predict.
As mentioned above the nature of such secondary mechanism is still debated, and important indications could be inferred by its temperature behavior. Further experiment in this direction could be determinant.



Preliminary analyis of IXS spectra of Liquid Aluminum. The data have not been corrected for empty cell contribution yet.