

Collective motions in molten alkali halides

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Inelastic X-ray scattering has been used to measure the density fluctuations of molten alkali halides. The experiments have been carried out at the inelastic beamline ID28 of the ESRF (Grenoble). With synchrotron radiation we could study the excitations in particular in the low momentum transfer range, where they do not interfere with optic type excitations. The inelastic excitations could be observed and analysed directly from the spectra. The deduced sound velocity for molten NaCl is about 70 % higher than the adiabatic sound velocity. Surprisingly the derived dispersion is very similar to the one of liquid Sodium [1]. A recently performed experiment on molten KCl shows the same trend. This system has the unique property in X-ray scattering to show only particle density fluctuations in the spectra without disturbance due to charge fluctuations. A possible explanation for the similarity of the dispersion relations can be the decoupling of the anion system from the movement of the cation background at high vibrating frequencies. Such a phenomenon has been observed in a MD simulation of a binary liquid some years ago and has received the name “fast sound” [2].

References

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[2] J. Bosse, G. Jacucci, M. Ronchetti, W. Schirmacher, PRL **57**, 3277 (1986)