Experimental report

26/07/2021

Proposal: DIR-202 **Council:** 4/2020

Title: Study of the Collective Density Fluctuations in Glass-Forming Liquids

Research area: Soft condensed matter

This proposal is a new proposal

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Experimental team: Peter FALUS

Local contacts: Peter FALUS

Samples: ZnCl2
K3Ca2(NO3)7

Instrument	Requested days	Allocated days	From	To
WASP	5	5	31/08/2020	05/09/2020

Abstract:

Recent theoretical and computational studies suggested that low energy collective modes, with shear nature indeed, exist in liquids and are enhanced in glasses. Furthermore, the appearance of these modes in collective density fluctuations characterized by the coherent dynamic structure factor is intimately related to the fragility of the liquids. Our recently developed ViscoElastic Hydrodynamic (VEH) theory predicts the common origin of the anomalous low-energy excitations in strong liquids and β-relaxation in fragile liquids is the manifestation of transverse collective modes. We have some preliminary experimental evidence on two glass-forming ionic compounds, K3Ca2(NO3)7 (CKN) and ZnCl2 from inelastic neutron scattering and NSE measurements. Herein, we propose to employ WASP to measure the slow relaxation modes (thermal diffusivity and an additional fast mode) of one model fragile liquid CKN and one model strong liquid ZnCl2 over a wider Q range than previously achievable.

$Ca_{0.4}K_{0.6}(NO_3)_{1.4}$ was measured at various temperatures between 383 K and 519 K, and at different Q's from 1.08 $Å^{-1}$ to 2.72 $Å^{-1}$.

The manuscript has been submitted, a preprint of the manuscript can be found at https://arxiv.org/abs/2106.04820