ESRF	**Experiment title:** The Johari-Goldstein relaxation as probe of the mosaic state in deeply supercooled liquids	**Experiment number**: SC-5151
Beamline: ID18	**Date of experiment**: from: 11/05/2021 to: 18/05/2021	**Date of report**:
Shifts: 8	**Local contact(s)**: Dimitrios Bessas	*Received at ESRF:*

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Report:

The experiment aimed at investigating the mosaic structure of supercooled 5-methyl-2-hexanol, exploiting the Johari-Goldstein relaxation as a probe [1]. We, therefore, employed time-domain interferometry to access microscopic density fluctuations associated with the Johari-Goldstein relaxation.

In detail, we used a new setup we recently introduced and which is based on 3-lines interferograms, that are intrinsically more efficient [2,3]: this allowed us to 1) extend the probed time window and 2) to properly estimate the relaxation strength associated (f_{JG}) with the Johari-Goldstein relaxation.

This information is of great importance as it identifies the number of molecules within the percolating clusters forming the mosaic states. In our previous investigations, we could (indirectly) extract only an average value [1], while in the present experiment we performed a systematic study of f_{JG} as a function of temperature and scattering vector (q). Fig. 1 shows a beating patterns measured at q=32nm^{-1},where the Johari-Goldstein relaxation governs the dynamics. The extracted intermediate scattering function is also shown. The decorrelation of density fluctuations can be

followed, completely, in the experimental time window, allowing us to accurately measure the relaxation strenght.
The data processing is basically completed and we were able to characterize the temperature and length-scale dependence of the “mosaic structure” and we are starting to prepare a paper to present our results [4].

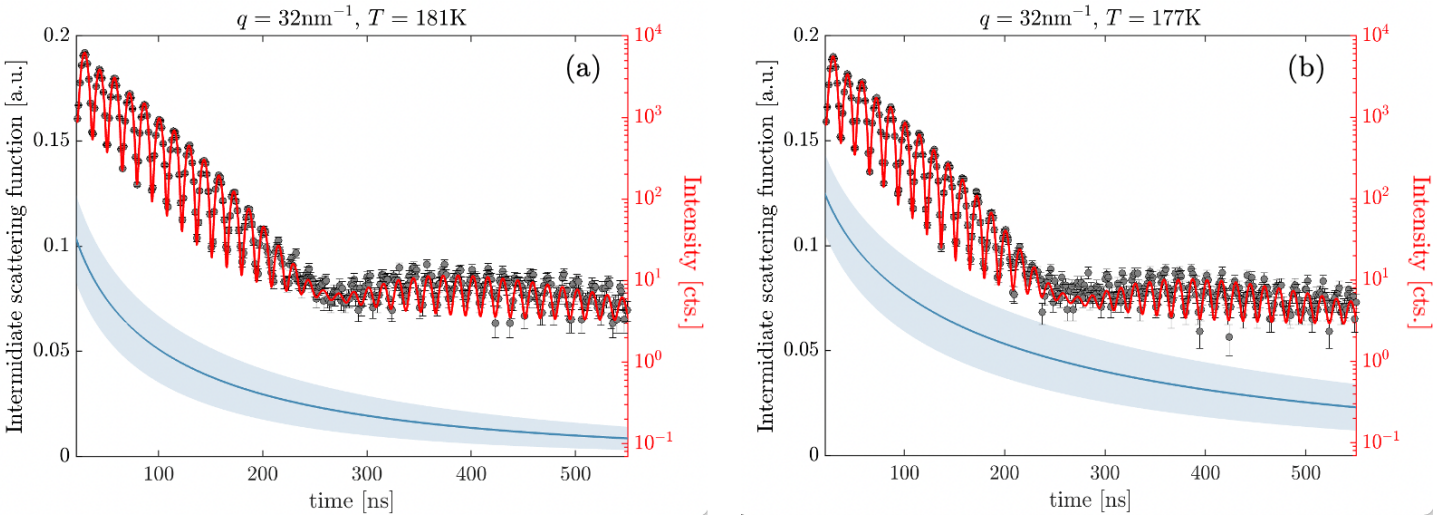

Figure 1: Time-domain interferometry data as a function of time (circles with ±1 SD errorbars) at different temperatures (a: 181 K and b: 177 K) and at a fixed exchanged wave-vector ($q=32\text{nm}^{-1}$). The blue solid lines are the intermidiate scattering functions of the Johari-Goldstein relaxation as extracted from the interferograms.

References

[1] F. Caporaletti et. al., Nat. Commun., (2021),**12,**1867
[2] F. Caporaletti et al., Sci Rep (2019), **9,** 14319
[3] F. Caporaletti et al., Rev. Sci. Instr. (2017), **88** (10), 105114
[4] F. Caporaletti et al., (in preparation), (2022)