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Structure and dynamics of levitated liquid glass formers measured with neutron techniques

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Abstract

Glasses have been made for millennia, but the phenomena of supercooling and glass formation are still not well understood and considerable work is being devoted to the study of the structure and dynamics of glass-forming systems in both solid and liquid states.

At very high temperatures, it is difficult to use conventional furnaces because the sample can react with the crucible and be contaminated. Furthermore, the furnace is often the main source of background in scattering experiments. Containerless techniques therefore provide an efficient alternative. The CEMHTI in Orleans has integrated aerodynamic levitation with laser heating into various instruments at the ILL. This makes it possible to study the structure and dynamics of liquids and glasses at temperatures above 1600°C.

In this presentation we show the experimental setups developed and some results obtained with molten calcium aluminates. Structural studies with neutron diffraction have been performed at the D4C diffractometer. In particular, the use of isotopic substitution provides more complete structural information. Information about relaxation times, viscosity and diffusion has been obtained with quasielastic neutron scattering at the triple-axis and time-of-flight spectrometers IN8 and IN6.