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Microscopic Dynamics of Structural Glasses Investigated by Quasielastic Neutron Scattering

Friday, 2 September 2022 09:00 (40 minutes)

In this presentation I will give a short introduction into quasielastic neutron scattering (QENS) and its application to glass-forming systems. QENS operates on time scales from picoseconds to a microsecond and at the same time has a spatial resolution in the Ångström range. Therefore, it is well suited for the study of molecular and polymeric glass-formers.

The dynamics of glass-formers is still poorly understood, but certain universal features can be found which a theory has to explain. Foremost, there is the α relaxation, which governs what is usually called 'glass transition'. Its temperature-dependence is highly non-Arrhenius and the shape of correlation functions non-exponential. In addition, faster relaxations may be present, among which the universal 'fast β relaxation' in the picosecond range is strongly related to the α relaxation in mode-coupling theory. As the fastest universal process, glasses show an excess of the vibrational density of states above the Debye model in the low frequency range, the so-called 'boson peak'.

All these phenomena can be observed by QENS with the additional information of a length scale. In addition, it is possible to study them in confined glass-formers in order to access their system-size-dependence. Selected QENS experiments will be presented and discussed.

Primary author: Dr ZORN, Reiner (Forschungszentrum Juelich)

Presenter: Dr ZORN, Reiner (Forschungszentrum Juelich)

Session Classification: Invited Talks

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