Experimental report

18/04/2024

Proposal: 6-04-288 **Council:** 4/2023

Title: Low temperature methyl group tunneling in polynorbornenes - Prove of missing spin conversation

Research area: Soft condensed matter

This proposal is a continuation of 6-04-285

Main proposer: Andreas SCHOENHALS

Experimental team: Reiner ZORN
Bernhard FRICK

Local contacts: Markus APPEL

Samples: PTCNSi1, C12_H20_Si
PTCNSi2g, C15_H28_Si

Instrument	Requested days	Allocated days	From	To
IN16B Si 111 BATS	3	3	22/05/2023	25/05/2023

Abstract:

The methyl group tunneling in amorphous materials is still not completely understood although some investigations are present in the literature. Especially no investigations at cryogenic temperatures are known. Therefore, it is suggested to carry out neutron backscattering on IN16B with the BATS option at cryogenic temperatures on a polynorbornene. In previous experiment on IN16B/BATS (6-04-285) an anomalous broadening of the low temperature resolution measured at a cryostat temperature of 40 mK in comparison to a corresponding polynorbornene was observed. As the cryostat temperature was 40 mK the temperature estimated from the neutron scattering data by the principle of detailed balance was around 1 K. This temperature difference could be explained by a missing spin conversion, a possibility hypothesized in literature. As the sample was wrapped in an Al foil an adverse effect of aluminum could not be ruled out completely. Therefore, it is suggested to repeat the measurement without wrapping the sample in Al. The data will be analyzed by the rotational rate distribution model for methyl group rotation extended by the scattering function for quantum tunneling.

_____EXPERIMENTAL REPORT_____

EXPERIMENT N°6-04-288 INSTRUMENT IN16B/BATS

DATES OF EXPERIMENT 22/05/2023-25/05/2023

TITLE

Low temperature methyl group tunneling in polynorbornenes - Prove of missing spin conversation

EXPERIMENTAL TEAM

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The experiment have been done. Currently the obtained data will be anylyzed.