

Experimental report

24/01/2024

Proposal: 9-11-2082

Council: 10/2022

Title: Local segmental dynamics in one component polymer nanocomposites

Research area: Soft condensed matter

This proposal is a new proposal

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Samples: (C₂H₄O)_n
C₄D₈)_n,(C₂H₄O)_n,(C₂D₄O)_n,C₆H₁₄O₂S₂
(C₄D₈)_n,(C₂H₄O)_n,(C₂D₄O)_n,C₆H₁₄O₂S₂

Instrument	Requested days	Allocated days	From	To
IN5	4	3	30/06/2023	03/07/2023

Abstract:

Local hydrogen dynamics of one component nanocomposites (OCNC) composed of core-shell nanoparticles (NP) grafted with polymer will be studied. NP core consists of cross-linked deuterated polybutadiene, the NP shell is represented by deuterated and hydrogenated poly(ethylene oxide) (PEO) chains. Specifically, incoherent dynamics of the hydrogenated PEO chains in the shell and dynamics of cross-linker molecules in the NP core will be investigated in the Q-range from 0.4 to 1.8 1/Å and on the time scale from 0.1 to 100 ps. As a reference the hydrogenated PEO chains in the bulk will be measured. The results obtained at IN5 are crucial to separate properly the coherent and incoherent contributions to the dynamic cross section in our recent experimental data obtained by NSE (WASP@ILL). Taking into account measurements at a few temperatures, resolution and background measurements we ask for 4 days of beamtime at the IN5 instrument.

Local segmental dynamics in one component polymer nanocomposites

Local hydrogen dynamics of one component polymer nanocomposites (OCNC) composed of core-shell nanoparticles (NP) grafted with polymer was measured. NP core consists of cross-linked (CL) deuterated polybutadiene (d-PB), the NP shell is represented by deuterated and hydrogenated poly(ethylene oxide) (PEO) chains. The incoherent dynamics of the hydrogenated PEO chains in the shell and dynamics of CL d-PB in the NP core was investigated in the Q-range from 0.4 to 1.8 $1/\text{\AA}$ and on the time scale from 0.1 to 100 ps. The results obtained at IN5 essentially support our WASP experiment. The experimental data will be treated jointly with the WASP data. The IN5 experiment was performed at the temperatures of WASPO experiment. The data evaluation is in progress.