Experimental report

14/02/2017

Proposal: **INTER-362** **Council:** 10/2016

Title: Internal time on IN1

Research area:

This proposal is a new proposal

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Experimental team: Orsolya CZAKKEL
Barbara BERKE

Local contacts: Monica JIMENEZ RUIZ

Samples: Heavy water D2O
Poly(N-isopropylacrylamide) (C6H11NO)n
graphene oxide (C2O)n
polymer gel composites

Instrument	Requested days	Allocated days	From	To
IN1	1	1	26/01/2017	27/01/2017

Abstract:

Experimental report – INTER-362

Experiment dates:26-27/01/2017
Experiment team: Barbara Berke, Orsolya Czakkel
Local contact: Monica Jimenez Ruiz

INTRODUCTION

The aim of the experiment was to study the interactions formed in carbon nanoparticle (CNP) filled soft gel systems based on poly(N-isopropyl acrylamide) (PNIPA). Such polymer gels exhibit a thermoresponsive behavior in which the matrix swells or deswells according to external stimuli. By incorporating CNPs into the polymer gel matrix, the response and shape-memory properties of the polymer can be combined with the physico-chemical properties of the nanocarbons. The synergy of different materials affects not only their macroscopic properties but can strongly influence their responsiveness as well. The sensitivity of CNPs to electromagnetic radiation (e.g., infra-red and/or radio-frequency) and their high thermal conductivity offer improved control over the swelling/deswelling.
Besides defining the macroscopic structural characteristics, knowledge of the formed interactions of nanocomposite systems is very important to produce composite systems with tuneable properties. Such investigations could, however, prove to be a challenge, owing to the limited number of appropriate methods, which are sensitive enough to study the very small difference in the gelstructure.

EXPERIMENT

Samples: pure polymer sample (PNIPA), graphene oxide (GO) containing polymer composite sample, and pure GO.
We used the IN1-Lagrange spectrometer with Cu 220 monochromator and graphite crystal analysator in the 26-500 meV incident energy range. The detected final energy was 4.5 meV. The temperature was kept at 10 K to minimize the background. We measured 200 000 counts in each point.
For the pure polymer and the composite samples (since they have relatively high H-content), the measurement took ~ 4 hours, but the GO sample had to be measured for ~ 8 hours.

RESULTS

The obtained signals of the pure polymer and the composite showed significant differences (see circled range on Figure 1. DFT calculations will be performed to analyze the spectra in details.

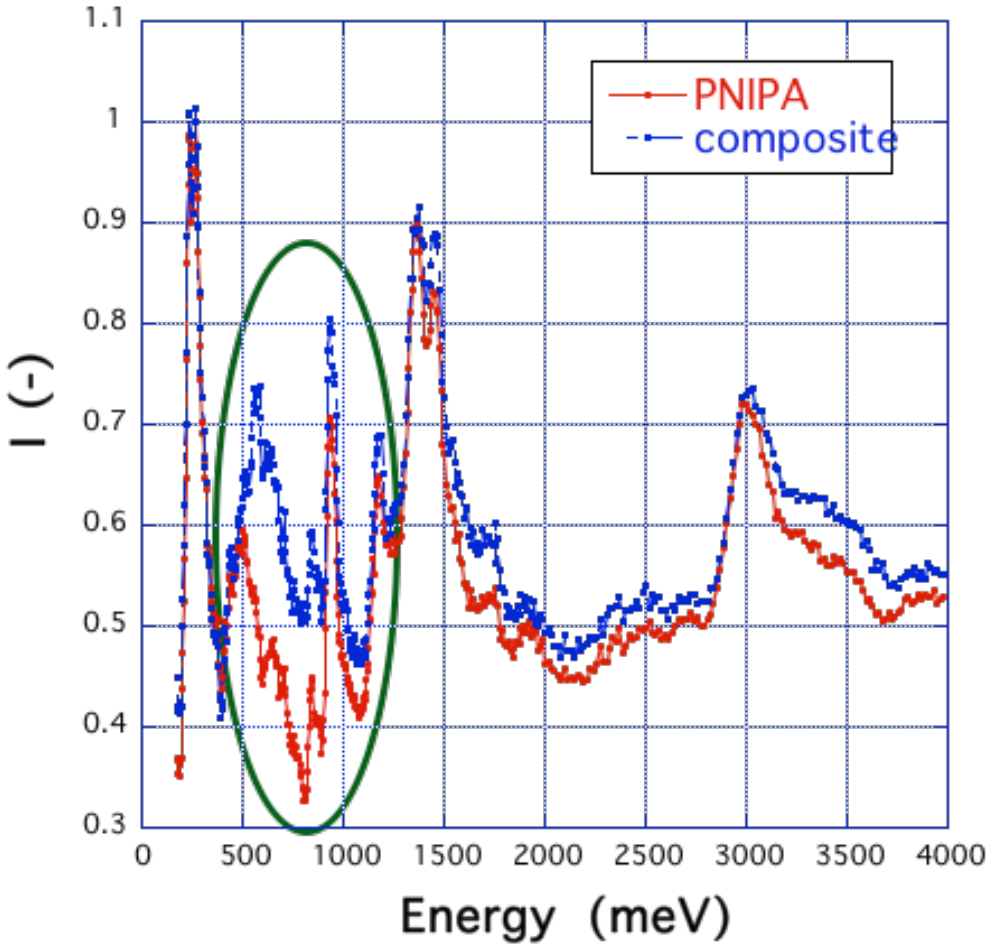

Figure 1: The measured energy spectra of the pure polymer and the GO-containing composite