Experimental report

23/11/2017

Proposal:	**TEST-2361**	**Council:**	4/2014
Title:	Dynamics of Physical Gels made of Small Organic Molecules		
Research area:			

This proposal is a new proposal

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Samples: Methyl4
6O-bensylidene-alpha-D-glucopyranoside

Instrument	Requested days	Allocated days	From	To
IN5	2	2	21/07/2014	23/07/2014

Abstract:

Experimental report on the experiment #TEST-2361:
Dynamics of Physical Gels made of Small Organic Molecules

Introduction

The family of methyl-4,6-O-benzylidene-α-D-**mono**pyranoside constitute our model system for the study of formation and stability of a gel made of small organic molecule in different solvents (including water).
Following a previous experiment, 2 days of internal beam time were requested to complete the first experiment and conclude on the data.

On IN5, we expected to characterize the dynamics of the solvent. Indeed, two populations of solvent should be distinguished : a bulk-like one, as the pores are rather large (probably larger than 100 nm) and a confined one, interacting with the fibers formed by the gelators. In this goal, two energy resolutions have been used (10 and 100 μeV) and two samples investigated: Methyl-4,6-O-benzylidene-α-D-**manno**pyranoside in water and in toluene at 300K at various concentrations (20, 35, 50 g/L).
Data were fitted with an elastic contribution plus two lorentzian contributions, either for the solvent of for the gels. Confrontation of linewidths in the gels or the equivalent solvents shows that the measured dynamics are almost identical. Both models therefore lead to the same conclusion: only the solvent dynamics is characterized, and the network provides only an additional elastic contribution. At 10 μeV (10A), the result is identical. Corresponding timescales are: 100 μeV : 6.5 ps ; 10 μeV: 65 ps ; 1 μeV : 650 ps. See figure 1.

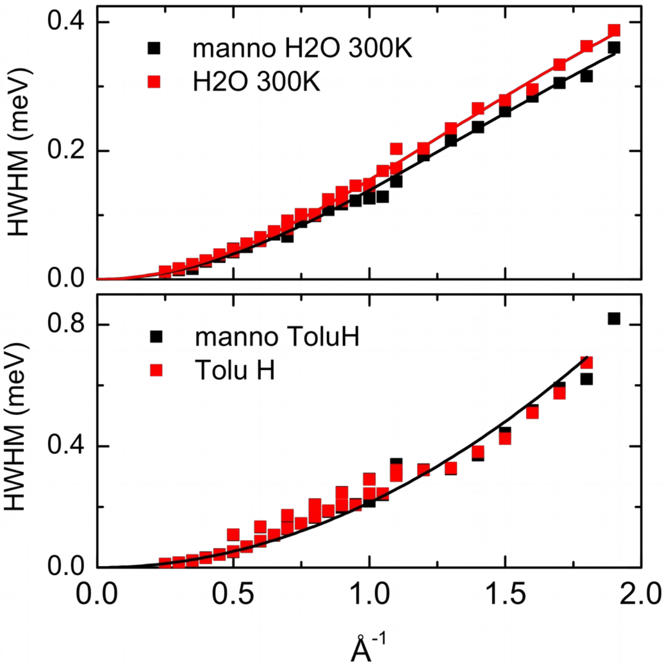
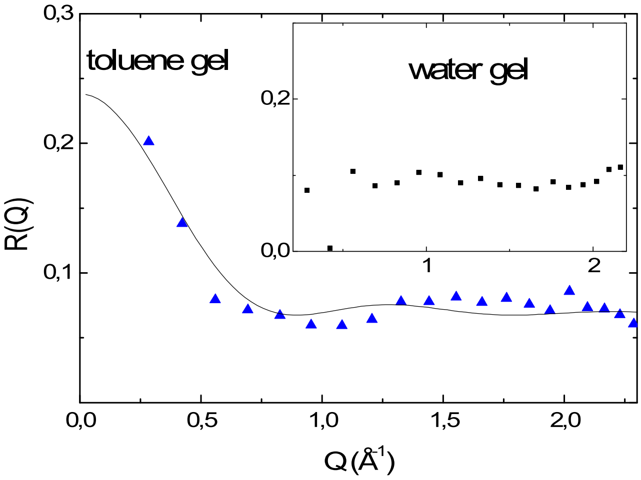


Fig.1: FWHM of the translational lorentzian contribution of the pure solvent and corresponding gels.

Eventually, the quantitative analysis of the elastic contribution, EISF, provided the number of solvent molecules trapped in the rigid network (see table and figure 2 below).



Sample	Solvent/gelator	R(0)	Solvent immobilised
Toluene	32.1	0.24	6.2 ± 2.1
water	180.2	0.1	10 ± 3

Figure 2 : EISF measure in toluene and fitted with an isotropic rotation model with radius of 3.8 A, corresponding to the free rotation the phenyl group. The table beside shows the number of immobilized molecule per gelator in each system.

The data have been include in the publication:

S. Spagnoli, I. Morfin, M. Gonzalez, P. Çarçabal and M. Plazanet, Solvent contribution to the stability of a physical gel characterised by quasi-elastic neutron scattering, Langmuir 31 (2015), 2554−2560.