Experimental report

27/06/2018

Proposal: **INTER-335** **Council:** 4/2016

Title: Internal time on IN13

Research area:

This proposal is a new proposal

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Samples: Si microspheres at different hydration

Instrument	Requested days	Allocated days	From	To
IN13	7	7	30/11/2016	13/12/2016

Abstract:

Scientific Report inter 331 and inter 335

The aim of the internal time experiment was 1) to extend our previous investigation on biological samples on simpler systems such as silica and polystyrene particles and sucrose aqueous solutions in H_2O and D_2O in order to mimic biologic systems. We investigated solid silica spherical particles with diameter size of 1 and 5 µm and in H_2O and D_2O hydration. To change the diameter of spherical particles, correspond to change the percentage of water/heavy water molecules that interact with SiO_2 particles. 2) To study water dynamics in the extra-particles space using solid silica. 3) To evaluate difference in water and heavy dynamics. The polystyrene samples were corrupted and are reported only for completeness.

Samples internal time 331 (02/06/2016):

1. Sucrose hydrated in 80% of H2O
2. Sucrose hydrated in 80% of D2O
3. Silica solid beads 5 µm in dry state

Samples internal time 12/11/2016:

1. Silica solid beads 1 µm in dry state
2. Silica solid beads 1 µm in 16% of H2O
3. Silica solid beads 5 µm in 16% of H2O
4. Silica solid beads 1 µm in 16% of D2O
5. Silica solid beads 5 µm in 16% of D2O

Samples internal time 335 (30/11/2016):

1. Silica solid beads 1 and 5 µm (50%-50%) in 16% of H2O
2. Silica solid beads 1 and 5 µm (50%-50%) in 16% of D2O
3. Silica solid beads 1 and 5 µm (50%-50%) in dry state
4. Polystyrene in dry state
5. Polystyrene in H2O (hydration to quantify)
6. Polystyrene in D2O (hydration to quantify)

We report the summed intensity obtained on in13 instrument for the silica solid particles with hydration of 16% which is the more interesting being the physiological hydration for animals tissues.

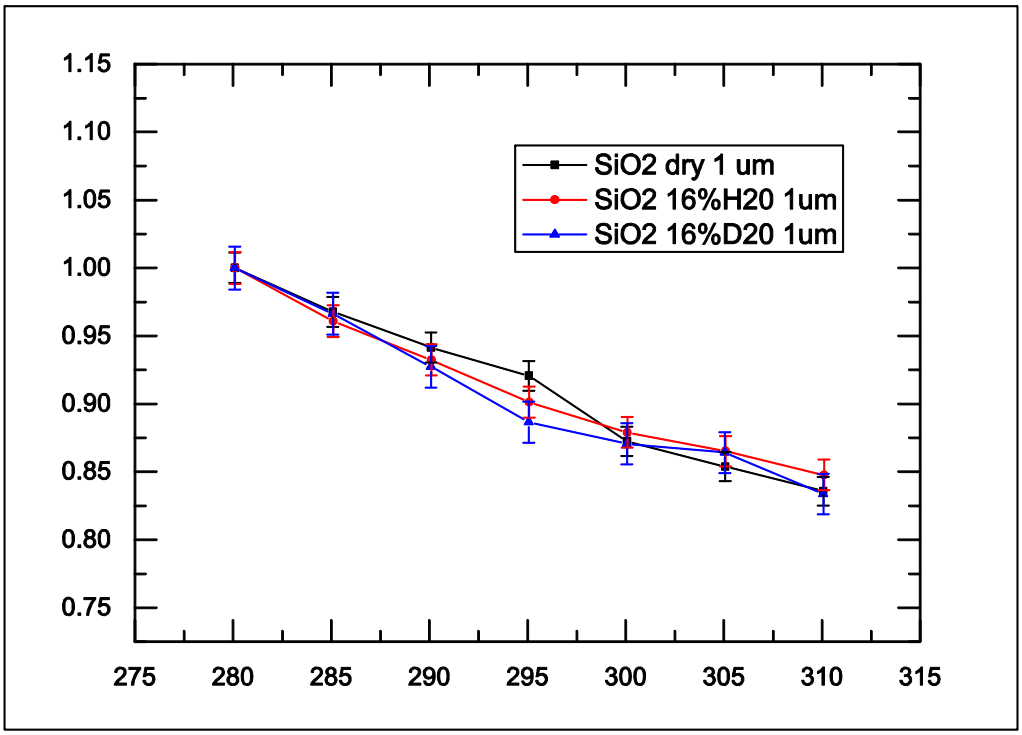

Figure 1: summed intensity of silica particles with diameter 1um. Data include matrix signal. Comparison between follow samples: dry, with 16% hydration of water and with 16% hydration of heavy water.

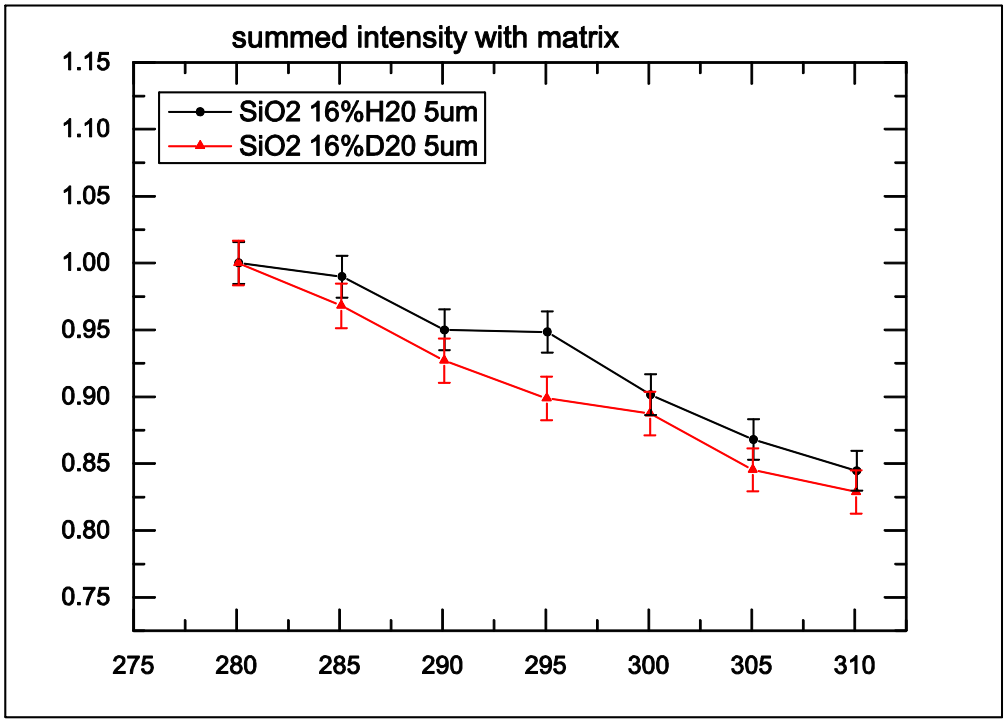

Figure 2: summed intensity of silica particles with diameter 5 um. Data include matrix signal. Comparison between follow samples: dry, with 16% hydration of water and with 16% hydration of heavy water.

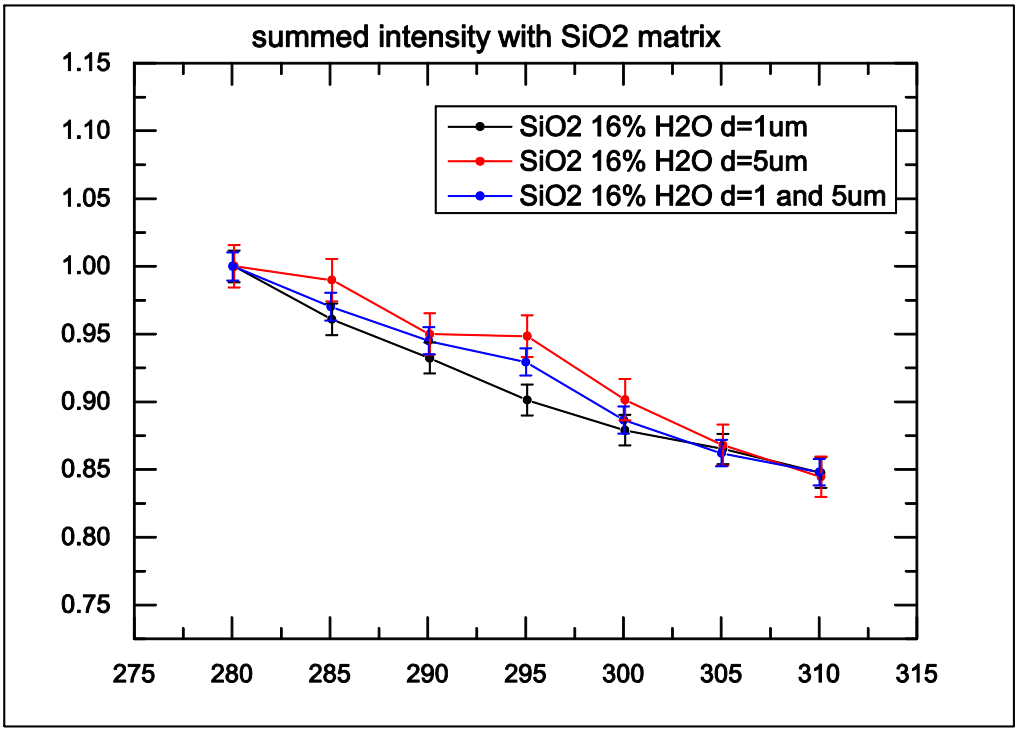

Figure 4: summed intensity of silica particles with 16% hydration of water. Data include matrix signal. Comparison between follow samples: silica particles with diameter 1, 5 um and mixed.

In Figure 1 summed intensity was reported for silica solid particles with diameter size of 1um and with have no evident difference in hydrogen dynamics between silica particle in dry and in water/heavy water hydration. In order to highlight such results, present also in the silica particles with diameter size of 5um we removed the signal from the dry sample (Figure 2) and it seems that hydrogens in water or heavy water do not show a significative difference in their dynamics. Similar results is obtained one we make a samples with a composition of 50% of silica solid particles with diameter size of 1um and of 50% of silica solid particles with diameter size of 5um.

These results tell us that with ENS on in13 we cannot rich our initial propose, therefore it seems that if some difference exit in water dynamics vs diameter silica solid particles and in water/heavy water interactions with silica solid particles have to be investigated with QENS on in5/in6/in16b.