

SESANS Standards Working Group Initial Meeting (22 March 2021)

Attendees

Wim Bouwman (WGB), Rob Dalglish (RMD), Fankang Li (FL), Andrew Parnell (AJP), Steven Parnell (SRP), Roger Pynn (RP), Gregory Smith (GNS)

Introductions

GNS welcomed everyone to the meeting, and everyone introduced themselves.

Mission

GNS prepared a draft mission statement, and comments were provided before the meeting. This was found acceptable.

The goal of the group should be to act as data curators and coordinators for measurements of standard SESANS samples. The group would decide on standards, and a stated goal should be to undertake a round robin experiment.

The standard sample must calibrate the x-axis, enabling instruments to be checked easily. These measurements must be quick to run as they should be run on every configuration. The ideal sample would also have both small features and something on the micrometre scale (or two standards may be required).

Furthermore, a particular consideration is a standard that can check the absolute polarisation to ensure that results are the same for different instruments (at different sources and with different wavelengths).

Progress on standard samples

Ideas for samples

RMD reiterated that to achieve a standard sample, someone needs to commit to performing measurements, take charge of organising them, and then decide how and when they are to be performed. There was then a discussion of possible options and their merits. Most options would work as secondary standards, but work is still required to identify a primary standard with depolarisation that could be determined *a priori*.

WGB mentioned silicon gratings (12 μm) that were measured as standard samples at Delft. These were expensive to make.

WGB has discussed aluminium oxide gratings as standard for USAS (with Brian Pauw). These were cheap to make, but the synthesis was irreproducible and the scattering dependent on orientation. A German company (Smart Membranes) has samples of macroporous silicon and nanoporous alumina that may be suitable <http://www.smartmembranes.de/en/products/nanoporous-alumina/>.

AJP presented several suggestions from materials he had in Sheffield: butterfly scales, imprinted periodic polymer surfaces, spin-coated polystyrene, and phase-separated AB block copolymers. He also has a colleague who producing polycarbonate filters with designed cylinder sizes. There were positive impressions of each of these, but no consensus was reached.

RP was concerned that colloidal samples or dispersions in fluid would be unstable in time. Another problem with colloids (for instance, silica) is that they are porous. Particles embedded in polymers might be more stable and suitable.

Most of these are secondary standards, as either the volume fraction or contrast would not be known with sufficient precision. This would hinder data modelling, as it would require one to be a floating parameter. RMD identified this as a particular problem for ToF instruments.

There was a discussion of what the USAS community uses for standards, and this should be investigated. Determining this would be useful. Cross-calibration of SESANS standards by USANS would be valuable.

Additional concerns for the future

Identifying a spin-echo length and depolarisation standard were viewed as the essential first steps.

There were several issues identified as areas of future consideration: saturation level varying for small objects, arbitrary Q range of integration in model fitting, and the balance of coherent and incoherent scatter in samples. Tackling these would likely reveal other issues and improve our understanding of SESANS instrumentation.

Status of instruments

ORNL Tests have been performed in PMMA latexes, but the instrument is not currently operational in SESANS mode (FL).

Delft The instrument should be operational later in the year, but it will require recalibration first (WGB).

ISIS There is a cycle later this spring (April to June), and after that, ISIS will go into long shutdown for the rest of the year (RMD).

Plan for measurements

Some of AJP's samples will be tested on Larmor in the upcoming cycle. If alumina gratings are at Diamond, these will be tested as well.

These data will be disseminated to the group. These samples will then be tested at Delft, once the instrument there is operational again.

Membership of working group

All attendees of this meeting were fine to be members of the working group.

A decision on who should be the convenor was not made and will be considered afterward. Those not attending will be asked if they are interested to join the group afterward.

Platform to manage working group

Data should be disseminated after measurements are performed by email. A mailing list will be set up.

The CanSAS wiki area will be used for communications about the group and presenting measured data.

Dissemination plan

This was not discussed. The suggested plan before the meeting was to announce the mailing group on neutron/SAS mailing lists. The group members should also contact interested colleagues to see if they wish to be observers.

Next meeting

A date was not selected. This will be booked in Summer 2021, once the first calibration measurements are performed at ISIS.

Actions

- Perform measurements at ISIS in May 2021 (AJP, RMD, GNS)
- Determine if alumina gratings are at Diamond (GNS)
- Disseminate previous Indiana data on porous alumina (SRP)
- Contact USAS beamlines to see what they use as standards (GNS)
- Decide on convenor and group members (all)
- Set up mailing list and webpage on CanSAS wiki (GNS)