

REPORT FROM GiSANS WORKSHOP

BACKGROUND

Grazing-incidence Small-Angle Neutron Scattering (GiSANS) is a state-of-the-art tool to investigate nano-sized order on surfaces as well as in thin films and multilayers *e.g.* quantum structures, magnetic spin order, vortex states in superconducting films, self-organizing block polymers and biological systems. The goal of this workshop was to provide impetus to the discussion about the use of the GiSANS technique at KTH in general, but also to initiate a discussion how to get (KTH in specific and Sweden in general) involved with neutron instrument development at the upcoming ESS. During the workshop the basics of neutron scattering is covered as well as the state-of-the-art with respect to GiSANS. Further, examples of research using the GiSANS technique is presented along with examples of scientific areas that could potentially benefit from using this method. Finally, the present developments at ESS and potential for using GiSANS was *planned* to be discussed (see below). This workshop received full financial support from the **Materials Platform of KTH**.

BRIEF SUMMARY OF WORKSHOP

In total we had more than 30 participants at this workshop (a few more than officially registered, see list below), of which 70% came from KTH (not counting the invited speakers). A few external participants from Uppsala University and Gothenburg University attended the meeting. Further, we also had a delegation of invited GiSAS experts mainly from Germany but also one from ILL in France. Finally, ESS representatives were also invited to our workshop but unfortunately they were not able to participate at this time.



Invited speaker Prof. Stephan Roth from DESY (now also Adjunct Prof. at KTH) introduce the potential of GiSAXS and its complementarities with GiSANS.

The workshop was started by a fundamental introduction to neutron scattering (by Martin Månsson) since many groups at KTH are not experienced in such techniques. The remaining talks of the first workshop day were all given by experts in both GiSANS and GiSAXS from Germany and France (see also program below) to highlight the importance of; and the unique possibilities with, surface scattering techniques. During these talks a lot of interesting possibilities arose and there were ample discussions both during the afternoon as well as the following workshop dinner concerning possible projects that could be conducted already now using the currently available GiSANS instruments in Germany.

At the end of the workshop the organizers (Daniel Söderberg and Martin Månsson) sat down together with representatives from Germany (Peter Müller-Buschbaum, Henrich Frielinghaus, Moulin Jean-François and Philipp) to discuss a possible roadmap for driving a joint development project towards a dedicated GiSANS instrument at ESS (instruments 17-23). From the discussions during the two workshop days it was very clear that a scientific as well as possible also an industrial case could be made for a Swedish GiSANS instrument at ESS. From both their scientific background as well as previous involvement in an earlier instrument proposal to ESS, our German colleagues have stated that they will be very happy to support us in a new GiSANS proposal to ESS. They could contribute both scientific and technical expertise for a proposal and if the proposal would be accepted they could foresee their involvement in both hardware development and manufacturing.



CONCLUSIONS & NEXT STEPS

From these two workshop days it was very evident that internally at KTH there is a broad interest and clear potential for using GiSANS from a wide range of scientific areas including:

- ***Magnetism and superconductivity***
- ***Energy Materials and Technologies***
- ***Quantum materials***
- ***Spintronics***
- ***Surface physics/chemistry***
- ***Corrosion Science***
- ***Catalysis***
- ***Fiber and composite technology***
- ***Semiconductor Materials and Technology***
- ***Surface Coating***
- ***Construction Materials***
- ***Plasma Physics***
- ***Organic Chemistry***
- ***Mechanics and Engineering***
- ***Fluid Mechanics***
- ***Tribology / Friction and Lubrication***
- ***Soft Matter***

With this we almost cover all of the present schools at KTH, except the School of Biotechnology. For the latter we are currently making a general effort to activate the field of biotechnology and life science to participate in the neutron scattering discussions at KTH. In addition to the broad scientific fields listed above, such research groups also bring along a long list of industrial partners that also could benefit from using the GiSANS technique.

These include for instance Toyota Central Research & Development Labs. (TCRDL), SSAB, Sandvik, Outokumpu, Atlas Copco, Permascand AB, Ljungaverk, AkzoNobel and Stora Enso. In addition there are several centers and strategic laboratories at KTH that could both benefit and contribute to a GiSANS development at ESS. Here we would especially like to mention e.g. the Wallenberg Wood Science Center (**WWSC**), the Molecules and Materials at Interfaces Laboratory (**2MILab**), Science for Life Laboratory (**SciLifeLab**) as well as Swedish e-science Research Centre (**SeRC**). Here the latter could be a very valuable asset for data analysis, computer modeling etc.

At KTH we have from this workshop concluded and decided the following:

1. There should be an instrument development at ESS driven by Swedish universities/institutions/industry.
2. There is a clear interest and broad potential use for the GiSANS at KTH
3. We will move ahead with discussion for putting forward a KTH lead proposal for a dedicated GiSANS instrument at ESS (in collaboration with Germany and possibly other Swedish universities).
4. We need to discuss with VR etc. concerning funding possibilities (***Addendum: There is a VR call opening in August 2016 concerning funding for instrument planning projects related to ESS.***)
5. Next meeting for further discussions should involve ESS and is planned for March 2016. (***Addendum: ESS representatives were unavailable to join at such time and the meeting has been postponed to August 2016.***)
6. The working name for our dedicated GiSANS instrument is decided to be:

GRAZE



LIST OF PARTICIPANTS

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* *Invited Speakers*



Workshop Program



Photo: Jann Lipka

GiSANS workshop

KTH, Stockholm, 26-27 November

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The workshop will be held in the Faxén seminar room, Teknikringen 8, Entrance level, please find the directions in the attached map!

For further information please contact:

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Schedule of the workshop

Thursday 26 November

10:00-10:15	Welcome and introduction to the workshop and to KTH
10:15	Session 1 <ul style="list-style-type: none">• Research at KTH• Introduction to neutrons <i>Martin Månsson, KTH</i>• Advanced morphology characterization based on grazing incidence small angle neutron scattering <i>Peter Müller-Buschbaum, TU München</i>• Similarities, differences and the potential of GISAS using x-rays and neutron <i>Stephan Roth, DESY</i>
12:30	Lunch
13:30	Session 2 <ul style="list-style-type: none">• GISANS at liquid-solid interfaces <i>Max Wolff, Uppsala University</i>• Dynamics in GISANS geometry <i>Henrich Frielinghaus, JCNS Jülich</i>• GISANS at Figaro <i>Philipp Gutfreund, ILL Grenoble</i>• GISANS at REFSANS <i>Jean-Francois Moulin, HZG</i> <p>Discussion on the way forward with GiSANS at ESS</p>
17:30	End of the day
19:00	Joint dinner

Friday 27 November

09:00	Short presentations from participants on their scientific efforts <ul style="list-style-type: none">• <i>Detailed agenda will be set based on participation</i>
10:30	Group discussion where one experienced GiSANS user could discuss feasibility with inexperienced "future" users
12:00	Wrapping up
12:30	Lunch

Teknikringen 8 Entrance level

