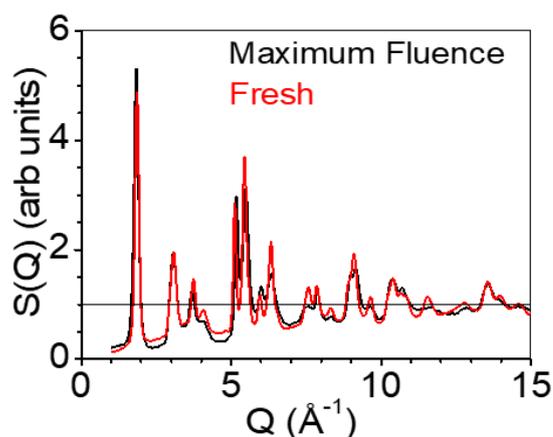
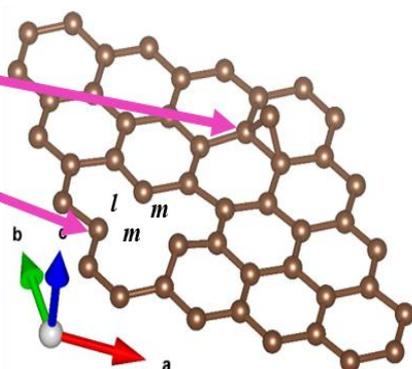


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4-coordinated
carbon atom

2-coordinated
carbon atom



Defect structure in irradiated graphite studied with neutron diffraction. Published in *Phys. Rev. B* 102, 064103 (2020). A recent research highlight from the National Facility for Neutron Research (India).

President's Report

As a new year beckons, we can reflect on the challenges and successes of 2020. The COVID19 pandemic affected our lives and work in many different ways. Neutron research centres, which are by their nature, international hubs of collaboration, were affected strongly by the restrictions on travel. On the other hand, the need for internationally-linked scientific research and collaboration has become more important than ever. For this reason, our organization, the Asia Oceania Neutron Scattering Association (AONSA) held its meetings in an online format. Our most recent executive committee meetings and facility directors meetings in 2020 were attended by nearly all of our members and facility representatives, which made the meetings particularly diverse, successful and fruitful. I am really happy that we had vibrant discussions focusing on how to improve the role of AONSA to better serve our communities, such as training and education, better website services and so on.

It is good to see that more facilities and beamtime were available in the second half of 2020 in our region. Another positive development is that JRR3 and HANARO will restart soon. I am very confident that we will have a brighter future.

A highlight of the AONSA mission has been the recent announcement of the 2021 AONSA Prize, and the 2021 AONSA Young Research Fellowships.

The AONSA prize recognizes the individual achievements over the lifelong career of a leading scientist to establish a legacy of neutron scattering science in the Asia-Oceania Region. Our most recent recipient is Prof Rob Robinson who was instrumental in establishing the neutron scattering facility at ANSTO in Australia. I should note that Prof Robinson also played an important role at the earliest stages of establishing AONSA. You can find details of his career contributions on Page 3 of this newsletter.

Our second major initiative, the AONSA Young Research Fellowship, is aimed at early career researchers, to allow young scientists to travel between facilities within the region and to develop their scientific skills through collaboration with leading scientist at the major facilities. This year's recipients are Teng Lu, Dr. Indri Badria Adilina and Dr. Rezwanul Haque. Details of the funded projects are given later in this edition of the AONSA newsletter.

I warmly congratulate all of the recipients of the AONSA awards.

Finally, it has been announced that our regional conference — the AOCNS-2023 meeting — will be held in Dongguan China. In related news, unfortunately, the International Conference on Neutron Scattering (ICNS) has been postponed until 21-25 August 2022. We will keep close communication with our sister societies – the Neutron Scattering Association of America (NSSA) – and the European Neutron Scattering Association (ENSA) and look forward to celebrating together at the next ICNS.

Prof. Dongfeng Chen



Professor Dongfeng Chen graduated in Jilin University for his BS (1991) and received his MS (1995) and PhD (1998) in China Institute of Atomic Energy (CIAE). Then he came back to CIAE after finishing two-year post-doctoral research in Argonne National Laboratory, USA, (1998-

2000). He has been senior Professor of Department of Nuclear Physics (DNP), CIAE since 2001 and Director of DNP from 2011 to now. He is served as the chief scientist of national 973 projects, "The Key Technology of Neutron Beam on CARR" and invited professor in both Peking University and Jilin University. Moreover, he also served as Vice-President of CNSS (2012-present), Co-Chair of Gordon Research Conference (2019-present), AONSA Treasurer (2016-2017) and AONSA Vice-President (2018-2019). His main research areas are neutron scattering instrumentation and condensed matter physics.

Announcement of the AONSA Prize 2021

The Selection Committee (SC) for the AONSA Prize 2021 received multiple nominees by the nomination deadline (August 31, 2020), and intensively reviewed them for a few months. All of the nominees made significant contributions to the field of neutron scattering in the Asia-Oceania region and are highly qualified, reflecting the quality of neutron science in the region. Finally, the SC unanimously nominated Professor Robert A. Robinson as the recipient at the 25th Executive Committee Meeting, held online due to the COVID-19 pandemic on November 28, 2020, and there, the SC's nomination was officially approved. The recipient will be awarded a certificate, a medal and a monetary prize (US\$5,000) at the Prize Ceremony to be held during the International Conference on Neutron Scattering, Buenos Aires, Argentina.

Citation: *“For his outstanding achievements in understanding magnetism of actinide and heavy-fermion materials using neutron scattering, seminal contributions in building the world-leading neutron facility in Australia, and continuous dedication for the promotion of neutron science in the Asia-Oceania region.”*

Prof. Dr Robert A. Robinson received his Ph. D from Cambridge University, working with Prof. G. L. Squires. Then, he joined the Los Alamos National Laboratory (LANL) in 1982 as a postdoctoral research fellow. He was then promoted to a technical staff member at LANL in 1985 and stayed there until he moved to Australia in 1999, where he was appointed to the Australian Nuclear Science and Technology Organisation (ANSTO) to lead the Neutron Scattering and Synchrotron Radiation Group. Prof. Robinson established the Bragg Institute at ANSTO in 2002, serving as Head until he retired in 2016.

Early in his career, Prof. Robinson accomplished a number of seminal works in the field of condensed matter physics. They included the celebrated discovery of quantum critical E/T scaling in the non-Fermi-liquid compound $UCu_{5-x}Pd_x$, and a detailed quantitative determination of the interacting Hamiltonian in the Mn_{12} -acetate, a very fundamental contribution which elucidated



*Robert A. Robinson
Retired from the Australian Nuclear
Science and Technology Organisation
Present address: Institute of Quantum
Beam Science, Ibaraki University,
and
School of Physics, University of
Wollongong*

the quantum tunneling of magnetization in the molecular magnet. These highly influential achievements granted Prof. Robinson an international reputation as an outstanding neutron scientist, and he was selected to lead the effort to establish a world-class neutron facility in Australia.

As a facility director, Prof. Robinson showed

unparalleled accomplishments, establishing a state-of-the-art neutron facility in Australia to replace the smaller, aging facility at the old HIFAR reactor. This had the byproduct of introducing many new advanced neutron techniques (e.g. polarized neutrons, high-resolution backscattering neutron spectroscopy). To do this, he recruited, hired, mentored and led a cadre of talented young scientists, who now lead neutron science not only in the Asia-Oceania region but also worldwide. This development of young talent within ANSTO is definitely beneficial to the neutron community in Australia, as well as in the Asia-Oceania region. He revitalized the Australian Neutron Beam Users Group and brought the International Conference on Neutron Scattering to Sydney in 2005. Prof. Robinson was a founding partner in the formation of the Asia-Oceania Neutron Scattering Association (AONSA) and was an inaugural chair of its Facility Directors' Meeting (FDM). Prof. Robinson has worked tirelessly to develop the

neutron scattering community in the Asia-Oceania region and has turned it into the very fruitful and exciting community which we enjoy now.

For his seminal achievement in neutron science, he received the following awards:

Fellowship of American Physical Society (1998), Fellowship of Australian Institute of Physics (2003), Australian Nuclear Association Award (2014), Australian Neutron Beam Users Group Career Award (2017).

Taku J Sato
Vice President of AONSA

Announcement of AONSA Young Research Fellowships for 2021



Dr. Teng Lu



Dr. Indri Badria Adilina



Dr. Rezwanul Haque

The AONSA Young Research Fellowship Program, which was established in early 2014, is designed to support highly talented young scientists with leadership potential in the Asia-Oceania region, helping them to develop their careers and expertise in neutron science and technology. All applications were received by the

submission deadline (August 31, 2020), and intensively reviewed by the Selection Committee (SC) for the AONSA Young Research Fellowship (YRF) 2021 awards.

The final selections were made by the SC in consultation with three hosting neutron Facilities



and officially approved at the 25th AONSA Executive Committee Meeting on November 28, 2020, held online due to the COVID-19 pandemic. It is AONSA's great pleasure to announce that three highly talented young scientists have been selected as the winner of the AONSA YRF 2021, who will visit major neutron Facilities in the Asia-Oceania region for collaborative research using neutrons in 2021. The AONSA YRFs' round-trip airfare will be supported by AONSA, and their local living expense during their Fellowship visits will be supported by their hosting Facilities.

Awardee: Dr. Teng Lu

Qualification: PhD Research School of Chemistry, The Australian National University (Australia) (2018)

Current affiliation: The Australian National University

Hosting Facility: J-PARC

Title of Research Proposal: *The order-disorder feature and lattice dynamics in silver niobate-based materials*

Awardee: Dr. Indri Badria Adilina

Qualification: PhD Applied Chemistry and Biotechnology, Chiba University (Japan) (2013)

Current affiliation: Indonesian Institute of Science (LIPI)

Hosting Facility: ANSTO

Title of Research Proposal: *Neutron scattering studies of the nanoparticle-protein interaction on modified geothermal silica*

Awardee: Dr. Rezwanul Haque

Qualification: PhD Faculty of Science, Engineering and Technology, Swinburne University of Technology (Australia) (2014)

Hosting Facility: CSNS

Current affiliation: University of the Sunshine Coast

Title of Research Proposal: *Exploring the mechanical properties of Pb-free SAC-305 solder with Bi additions*

Taku J Sato

Vice President of AONSA

Report on the 25th AONSA Executive Committee Meeting

The 25th AONSA Executive Committee Meeting was held on November 28th, Saturday, 2020, using the online ZOOM platform for the second time in a row since June. It was originally supposed to be held in China in conjunction with the 12th AONSA Neutron School, which was also postponed to 2021 due to the ongoing coronavirus outbreak. In total, twenty-one delegates joined the meeting from different time zones, which was a bit reduced from the last ZOOM meeting. Dongfeng Chen (CIAE), as the President of AONSA, opened the meeting with a welcoming remark. After the usual self-introductions, the draft minutes of the 24th EC meeting were summarized by myself (Jae-Ho Chung, Korea U.) as the Secretary.

The first matter discussed was the report of the Online Board Meeting held on October 23, 2020. The board members had discussed the

current coronavirus situation and agreed to propose a one-year postponement of the upcoming International Conference on Neutron Scattering in Argentina from 2021 to 2022. The postponement was then officially announced by the local organizers in a matter of one week. The new dates for the ICNS will be August 21-25, 2022.

Taku Sato (Tohoku U) reported on the selection results of the AONSA Young Research Fellow 2020-2021 and the AONSA Prize 2021, respectively. The selected YRF candidates include Dr Teng Lu (Australian National University, ANBUG) applying to work at J-PARC; Dr Indri Badria Adilina (Indonesian Institute of Science, INSS) applying to work at ANSTO, and Dr Rezwanul Haque (U of Sunshine Coast, ANBUG) applying to work at the CSNS. The members approved the selection of the three candidates. As for the AONSA Prize

2021, the selection committee nominated Robert Robinson (previously at ANSTO, ANBUG) as the winner, which was then approved unanimously by all members of the EC. Taku Sato also made an interim summary of the mid-career award which is intended to fill the gap between the YRF and the AONSA Prize. The rules are not yet finalized, and the discussions will continue for some more time.

It is unclear how long the EC meetings will continue to be held virtually on ZOOM. Everybody hopes to meet in Indonesia for the 26th EC meeting in June, and for the 27th in China.

However, there still is a chance that the travel restrictions will continue through 2021. Either way, ZOOM will help us communicate through this difficult time. See you next time.

*Jae-Ho Chung,
Korea University (Secretary of AONSA)*



A screenshot of the Zoom meeting at the 25th AONSA Executive Meeting.

Report on the 19th Asia-Oceania Facility Directors Meeting

1. Date, venue and participants

The 20th Facility Directors Meeting (FDM) was held online on Friday 20th November 2020. Participants are as follows.

[Chair]

Kenji Nakajima (J-PARC/JAEA)

[FDM Members]

Wanchuck Woo (HANARO)

Fangwei Wang (CSNS)

Toshiya Otomo (J-PARC/KEK)

Masayasu Takeda (JRR-3/JAEA)

Jamie Schulz (OPAL, ANSTO)

Kai Sun (CARR/CIAE)

P. U. Sastry (DHRUVA)

Rifai Muslih (G. A. Siwabessy)

C. Q. Huang (CMRR)

[EC Board Members]

Dongfeng Chen (President; CNSS, CIAE)
Taku J. Sato (Vice-president; JSNS, Tohoku U.)
Jae-Ho Chung (Secretary; KNBUA, Korea U.)
Hsiung Chou (Treasurer; TWNSS, National Sun Yat-Sen U.)
David Cortie (Public Relations Officer, U. Wollongong)
Brendan Kennedy (Past-president; U. Sydney)

[EC Members]

Hesheng Chen (CNSS, IHEP)
Kazuhisa Kakurai (JSNS, CROSS)
Yun Liu (ANBUG, Australian National U)
Chun-Chuen Yang (TWNSS, CYCU)
Evvvy Kartini (INSS, BATAN)

[Observers]

Viacheslav Em (NRCKI)
Hideki Seto (J-PARC/KEK)
Apichate Maneewong (Thai Community; TINT)

2. Meeting minutes

a) Regular opening items.

The meeting was begun with opening remarks made by KN followed by self-introduction of all attendees. This included the confirmation of purpose, the role of the FDM and the approval of the agenda.

b) Approval of a new observer member
National Research Center "Kurchatov Institute" (NRCKI) was approved as a new observer member.

c) Review of last meeting notes

The last meeting was reviewed by KN. There were no comments from participants.

e) Facility updates reports

e-1) JRR-3 (Masayasu Takeda)

An update on the seismic construction of the reactor was reported. The reactor will restart from February and the user program will resume from July. JAEA and Univ. of Tokyo, along with other university groups, were preparing to restart research activities.

e-2) J-PARC (Toshiya Otomo)

Recent developments were reported, including the operation at 1 MW for 36.5 hours in the last June. The impact of the COVID-19 pandemic on the user program and actions to mitigate this were explained.

e-3) CSNS (Fangwei Wang)

The current status of the facility and the user program were reported. The 1st replacement of the target was done successfully in August. The AONSA Neutron School originally planned for 2020 will be postponed.

e-4) HANARO (Wanchuck Woo)

An update of the reactor status was reported. The reactor restarted and its power was increased towards 30 MW. The user program will be resumed from 2021. The planned actions to mitigate the impacts of COVID-19 was explained.

e-5) OPAL (Jamie Schulz)

The status of the reactor, instruments and user program were reported. The impact of the COVID-19 pandemic and counter actions were explained. Recent workshops and details of an upcoming neutron school, both held online, were shown.

e-6) CARR/CIAE (Kai Sun)

The reactor operation and the user program status were reported. Highlights of recent scientific outputs including COVID-19 related research were shown. An updated status of the instruments was also reported.

e-7) CMRR (C. Q. Huang)

Recent statistics of the user program was reported. The current status was given of running and instruments and those that are under construction, Recent scientific outcomes were highlighted..

e-8) DHRUVA (P. U. Sastry)

An update on the status of the reactor and instruments was reported. The status of the user program and the statistics of scientific outcomes was shown. The impact from the COVID-19 pandemic was reported.

e-9) G. A. Siwabessy (Rifai Muslih)

The status of the facility and outcomes from the user program were reported. Recent conferences held on-line were highlighted. Actions to reduce the COVID-19 impact were also explained.

e-10) NRCKI (Viacheslav Em)

An overview of IR-8 8 MW reactor and PIK 100 MW class reactor was given. The upgrade plan of IR-8 and construction schedule of PIK were explained. The impacts of the COVID-19 at NRCKI was also reported.

f) Discussion on the challenges, opportunities and cooperation of neutron facilities

f-1) Challenges during the COVID-19 pandemic

All running facilities were impacted by the COVID-19 pandemic in their user programs, although facilities in China are now returning to normal operations. All operational facilities reported difficulties in accepting users from across international borders. Mail-in service and remote-access are possible strategies to take, while they have issues (heavy work of instrumental scientists, reduction of number of possible experiments, the requirement of additional development of software etc.). Many of the facilities reported that they are trying to keep holding workshops, meetings and even schools by using on-line services. It was emphasized that support is needed within AONSA to enhance online activities (technical support, sharing know-how, sharing content such as videos). Sharing such information will be of benefit to the AONSA community.

The information of the COVID-19 related research activities was shared. Several activities of investigations on SAR-Cov-2 were going in collaboration with non-neutron facilities.

f-2) Regulation of membership of FDM

An issue was raised concerning the regulations governing membership (roles) of the FDM. We will discuss this continuously with close interactions between the AONSA board and

AONSA EC.

g) AONSA business

g-1) AONSA Young Research Fellows

We shared the information of the current status of 2020 fellows provided by the AONSA EC. Due to the COVID-19 impact, facilities (ANSTO, CSNS, J-PARC) postponed accepting 2020 fellows. Facilities are considering to accept them soon after the COVID-19 issue is solved.

g-2) Next AONSA Neutron School

We agreed that the 2021 School will be held at the CSNS. Concernin the situation for 2022, we will discuss in the next FDM.

h) Other business

Kenji Nakajima (J-PARC/JAEA) will act as the next chair.

Update on the AONSA Neutron School

Considering the COVID19 travel restrictions, a decision has been taken to allow attendees to access the school lectures online. Details will be available soon on the AONSA website at www.aonsa.org.

Reports from Member Neutron Associations

Report from the Australian Neutron Beam User Group (ANBUG)

ANBUG is a not-for-profit society representing the Australian and New Zealand neutron scattering community. It also welcomes the many other international users who conduct experiments using the Australian infrastructure. It engages with ANSTO on the provision of high-quality neutron scattering facilities in Australia; presents the collective viewpoint to government and international scientific associations. Our membership for 2020, exceeded 300 members.



Screenshot of the AANSS meeting held 11-13th November, 2020.

A highlight of the year was the virtual online conference, the ANBUG-AINSE Neutron Scattering Symposium, 11th – 13th Nov 2020. This was well attended, with many sessions attracting ~ 100 attendees and a lively and stimulating discussion. The event was streamed using Zoom and included live music and a trivia session.

The following **ANBUG awards** were presented at the AANSS:

- Prof John White (Career Award)
- Prof Anna Paradowska (Neutron Award)
- Dr David Cortie (Young Scientist Award)



ANBUG Australian Neutron Beam Users Group

FREE to join!

| | | |
|--|--|---|
| Student prizes and travel bursaries are available for all members | ANBUG is represented on the PAC & ACNS Advisory committees to ensure that members interests come first | ANBUG is a not-for-profit organisation with all proceeds from conferences given back to members via bursaries etc |
| Job applications and post-doc positions are regularly sent to the ANBUG mailing list | In the 1990's ANBUG played a key role in lobbying politicians to upgrade the OPAL reactor | To be a successful lobby group we need as many members as possible, particularly in the next five years |
| Our membership is open to everyone, including international users who conduct experiments at ANSTO | Even theorists who model neutron data should join ANBUG to ensure a healthy supply of data! | Currently of the ~ 500 users who conduct neutrons experiments each year ~60% are ANBUG members |

JOIN TODAY! www.anbug.net

Dr Damian Goonetilleke (Outstanding PhD Award)

AGM: The annual general meeting of ANBUG was held on 11th November. Current 2020 President Prof Tracy Rushmer thanked the 2019-2020 ANBUG executive: Yun Liu (VP), Andrew Clulow, David Cortie, Tilo Sohnel, Anna Paradowska, Ian Gentle and Katy Wood for all their work over this unusual year, including communicating with ANSTO Executive about access and impact to users during COVID pandemic.

2020-2021 ANBUG Executive: In 2021, our current Vice-President Yun Liu will become ANBUG president and Tracy Rushmer will stay on the ANBUG executive as Past President. We held nominations for new members as there some positions to become vacant. The 2021-2022 committee members are Prof. Yun Liu (ANU, President), Assoc. Prof. Chris Wensrich (Uni of Newcastle, Vice-President), Prof. Tracy Rushmer (Macquarie Uni, Past-President), Dr Leonie van't Hag (Monash Uni, Secretary), Dr David Cortie (Uni of Wollongong, Treasurer), Dr Karyn Jarvis (Swinburne Unit Tech, Website/Comms), Dr Teng Lu (ANU, ECR member), Dr Ben Mallett (Uni Auckland, NZ member).

On behalf of
Prof. Yun Liu, ANBUG president,
 Australian National University

NSSI has been actively involved in popularizing neutron scattering techniques in India. Some of the recent important activities of NSSI in this regard are:

1. The 6th Public Lecture on “Neutrons for Material Research and Technology under Frontiers in Physics-2020” has been delivered online by Dr S. M. Yusuf, Associate Director, Physics Group, BARC & President of NSSI on 17th October 2020.

2. Earlier, it was proposed to hold a lecture series annually by eminent scientists from India or abroad under the NSSI banner. In this regard, the 1st special lecture on neutron scattering will be delivered by Dr B. A. Dasannacharya, ex-Director, Solid State & Spectroscopy Group, BARC, Ex-director UGC-DAE-CSR and recipient of the 2nd AONSA Prize (2013).

3. It is proposed to organize a Neutron School on “Neutrons as a Probe of Condensed Matter” (XIX in the series) at BARC in June 2021.

4. Some instrument scientists and students at BARC have attended seminars, schools and conferences related to neutron scattering. These are a) Public lecture on Neutrons for Material Research and Technology, Speaker: Dr S.M. Yusuf, b) Workshop on Rietveld Refinement method, organized by UGC-DAE Consortium for Scientific Research, Mumbai Centre in association with Indore Centre, c) AANSS 2020: Online AINSE ANBUG Neutron Scattering Symposium, d) 1st PSI Condensed Matter Summer Camp 2020 virtual meeting on Topological aspects in Condensed Matter, organized by Paul Scherrer Institute, Villigen, Switzerland, e) Lecture Course on Neutron Scattering, being organized by Homi Bhabha National Institute, Mumbai (2020) during 5th October 2020 to 22nd January 2021. This event was inaugurated by Dr R. Chidambaram, DAE Homi Bhabha Chair Professor, former principal scientific advisor to Government of India and former secretary, Department of Atomic Energy,



India. The lecture course includes series of lectures on Basics of Neutron Scattering (by Dr Saibal Basu), Magnetic Neutron Scattering (by Dr S.M. Yusuf and Dr Anil Jain), Inelastic and Quasi-elastic scattering (by Dr S.L. Chaplot), Small Angle Neutron Scattering (by Dr V.K. Aswal), and Polarized Neutron Reflectometry (by Dr Surendra Singh).

*S. M. Yusuf, President,
Neutron Scattering Society of India*

Report from the Japanese Society of Neutron Science (JSNS)



As of October 10, 2020, the number of JSNS members is 581 including 52 students. In addition, there are 31 senior members. The number of supporting members is 32.

Currently, the election of the president and council members, whose term is ending in 2020, is underway.

JSNS Activities

The 20th Annual Meeting of the Japanese Society for Neutron Science
9-11 November 2020, virtual conference (Sendai), IMR and IMRAM, Tohoku University

Conference Chairperson: Prof. M. Fujita (IMR, Tohoku University)

Program Committee Chairperson: Prof. T.J. Sato (IMRAM, Tohoku University)

The 20th Annual Meeting of the Japanese Society for Neutron Science was held as a virtual conference ‘Online Sendai Annual Meeting 2020’ from Nov. 9 to 11, 2020. This anniversary meeting was originally planned to be held on the Tohoku University campus in Sendai, which became infeasible due to the on-going coronavirus pandemic. There were 53 oral and 95 poster presentations distributed over the three meeting days. The meeting program comprised a joint session with the Society of Muon and Meson Science of Japan (JMMS) and a JRR-3 Symposium. (see the program scheme below). Both of the webinar sessions were open and broadcasted on YouTube simultaneously. Despite or because of the online format there were 269 registered participants and over 1000 attendees including those who accessed the open session on YouTube. The invited speakers and their lecture titles in each session are listed below.

Plenary speakers: Plenary sessions (Mon):

Takeshi Egami (University of Tennessee & ORNL)
 “Correlated atomic dynamics in liquid seen in real space and time”

Junji Kido (Yamagata University)
 “Revitalization of Local Community by Organic LED”

JSNS Prize session (Mon):

Yukio Noda (Tohoku University (professor emeritus))
 “Contribution to the development of neutron structure analysis and the development of the Japanese neutron science community”

Atsushi Takahara (Kyushu University)
 “Characterization of Polyelectrolyte Brushes at Water Interface by Neutron Reflectivity and Soft X-ray Emission Spectroscopy”

Special session (upon call for session proposals) (Tue) Session Group 1

Frontiers in neutron biology structure research exploiting the deuteration technique and computer science

Aya Okuda (Kyoto University) et al.
 “Technical Strategy of Protein Ligation for Neutron Scattering”

Hiroshi Nakagawa (JAEA)
 “Solution structure of multi-domain protein studied by quantum beam scattering and molecular dynamics simulation”

Rintaro Inoue and Masaaki Sugiyama (Kyoto University)
 “Analysis of protein internal dynamics in solution as studied by quasielastic neutron scattering”

Ayori Mitsutake (Meiji University)
 “Toward the application of protein systems using molecular simulation methods”

Hitoshi Kurumizaka (Univ. of Tokyo)
 “Cryo-EM studies for chromatin dynamics”

Midori Takimoto-Kamimura (Teijin Institute for Biomedical Research & CROSS)
 “The Role of Neutron Life Science in Structural Biology in Future”

Joint open session of JSNS & JMMS (Tue) Session Group 1

Seung-Hun Lee (University of Virginia)



AONSA
“Role of Organic Molecules in Organic-Inorganic Solar Cell Perovskites”

Akihiro Koda (KEK) et al.
“Dynamic behavior of cation molecules in the hybrid organic-inorganic perovskite MAPbI₃ probed by μ SR”

Toyoto Sato and Shin-ichi Orimo (Tohoku University)
“Hydrogen absorption and desorption reactions of hydrogen storage materials studied by inelastic neutron scattering”

Hirotaoka Okabe (KEK) et al.
“Local effects of hydrogen in MnO₂ studied by μ SR”

Kazuhiro Mori (Kyoto University) et al.
“Neutron scattering studies for rechargeable battery materials”

Izumi Umegaki (Toyota Central Research and Development Laboratories)
“Li-ion Battery Observed by Muons”

Takashi Honda (KEK)
“Beginning of collaboration with societies related to quantum beams
- Establishment of the committee for promoting collaboration in quantum beam science”

Science session (Tue) Session Group 2

Collin Broholm (Johns Hopkins University)
Tutorial lecture, “Probing quantum materials with neutrons”

Yusuke Nambu (Tohoku University)
“Observation of the propagation mechanism of the magnon spin current through polarized neutron scattering”

Kazuki Iida (CROSS) The JSNS Young Researcher Prize award talk
“Magnetic fluctuations in unconventional superconductivity by pulsed neutron”

Science session (Tue) Session Group 3

Masahiro Hino (Kyoto University)
“Neutron resonance spin-echo spectrometers (VIN ROSE) and focusing supermirrors at BL06, J-PARC MLF”

Michihiro Nagao (NIST & Indiana Univ. & Univ. of Delaware) Tutorial lecture
“Invitation to Neutron Spin Echo Spectroscopy”

Bing Li (Institute of Metal Research Chinese Academy of Sciences) The 2019 JSNS Young Researcher Prize award talk
“Neutron scattering study of barocaloric materials”

JRR-3 symposium open session (Wed) Group 1

Yoji Murayama (JAEA)
“Outline and status of JRR-3”

Hikaru Kawamura (Toyota Physical and Chemical Research Institute)
“Mission of JRR-3 and expectation - From academia”

Masaaki Hibi (Industrial Users Society for Neutron Application & CROSS)
“Expectations of industrial application at JRR-3”

Kazuhiro Kakurai (JSNS & CROSS)
“Towards the concerto for JRR-3 and J-PARC MLF”

Toshiya Otomo (J-PARC & KEK)
“Expectations of JRR-3 from MLF”

Science session (Wed) Session Group 1

Shin-ichiro Meigo (JAEA & J-PARC) et al.; The 2020 JSNS Technology Prize award talk
“Proton beam control technology for high-intensity pulsed neutron production”

Shuki Torii (KEK) et al.; The 2020 JSNS Technology Prize award talk
“Development of Super High-Resolution Powder Diffractometer, SuperHRPD”

Science session (Wed) Session Group 2

Mitsuhiro Hirai (Gunma University) Tutorial lecture
“Basics of complementary use of neutron/synchrotron radiation X-ray scattering: Application to life science”

Science session (Wed) Session Group 3

Kazuki Komatsu (University of Tokyo)
 “A new horizon of the study of ice polymorphs
 by neutron diffraction under pressure”

Kanta Ono (KEK)
 “Optimized and automated materials
 characterization with neutron”

JSNS Awards

The following 2020 JSNS Prizes have been
 awarded.

The JSNS Outstanding
 Achievement Prize

- Yukio Noda

Tohoku University



*‘Contribution to the
 development of neutron structure analysis and
 the development of the Japanese neutron science
 community’*

The JSNS Science Prize

- Atsushi Takahara

Institute for Materials Chemistry
 and Engineering, Center for
 Polymer Interface and Adhesion
 Science, Kyushu Univ.



*‘Characterization of soft matter interfaces using
 neutron reflectometry’*

The JSNS Young Researcher
 Prize

-Kazuki Iida

Neutron Science and Technology
 Center, Comprehensive Research
 Organization for Science and
 Society (CROSS)



*‘Magnetic fluctuations in unconventional
 superconductivity by pulsed neutron’*

The JSNS
 Technology Prize

Shinichiro Meigo¹⁾,
 Hiroshi Fujimori²⁾,
 Shinnichi Sakamoto¹⁾
 and Motoki Ooi¹⁾



1) J-PARC Center, Japan
 Atomic Energy Agency
 (JAEA)

2) Institute of Materials
 Structure Science
 (IMSS),



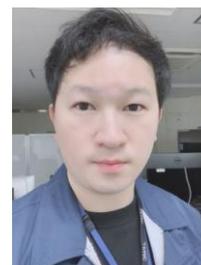
*‘Proton beam control technology for high-
 intensity pulsed neutron production’*

The JSNS Technology Prize

Shuki Torii¹⁾, Kenichi Oikawa²⁾, Masato
 Hagihara¹⁾, Kwanghee Cho¹⁾ and Takashi
 Kamiyama¹⁾

1) Institute of Materials Structure Science (IMSS), KEK
 2) J-PARC Center, Japan Atomic Energy Agency (JAEA)

*‘Development of Super High-Resolution Powder
 Diffractometer, SuperHRPD’*





Finally, *the 21st Annual Meeting of the Japanese Society for Neutron Science* will be hosted by the Institute for Integrated Radiation and Nuclear Science, Kyoto University and will be held in Kumatori from Dec. 1 to 3, 2021. The conference chairperson will be Prof. Masaaki Sugiyama. The Chair of the Program Committee will be Prof. Masahiro Hino. The meeting will be in a hybrid format. The online first day will include the JSNS

General Assembly and JSNS Awards Lectures. The face-to-face meeting on the second and third day will comprise the oral and poster sessions and Symposia on facility networking and gender equality.

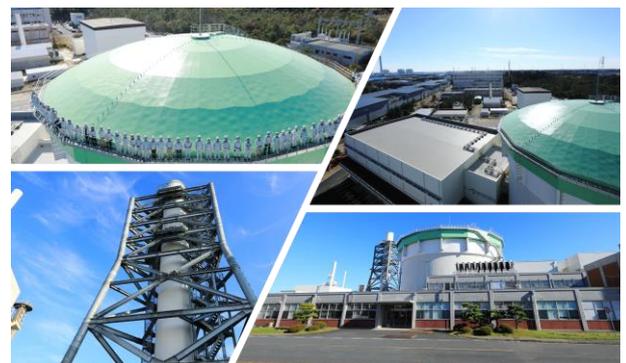
Kazuhisa Kakurai (JSNS)

Updates from Asia-Oceania Neutron Facilities

Report from JRR-3

JAEA (Department of Research Reactor and Tandem Accelerator): The seismic reinforcement works for the JRR-3 reactor building and peripheral structures were finished in the end of January 2021. In the same period, more strict safety measures were introduced in order to prevent or mitigate core damage accident. The pre-service inspection was completed successfully and the final check and inspection were just started. JRR-3 is now ready to restart in the end of February as scheduled in spite of COVID-19 influence. The general user proposals were called in last November. More than 130 proposals were submitted and they are now under the reviewing process. JRR-3 will open to the general users in the end of June after test operations for three months. Four consecutive operating cycles (one cycle = 25 days) are planned until November in Japanese fiscal year 2021. The annual safety inspection will be conducted during almost five months, and startup for the first cycle in 2022 is scheduled in the beginning of May 2022.

JAEA (Materials Sciences Research Center): JAEA (Materials Sciences Research Center) : JRR-3 online symposium was held in the annual meeting of JSNS in last November in cooperation with JSNS and Tohoku University. Total number



Photographs of the new roof of JRR-3 building and the stack after reinforcement work/

of participants was approximately 670 including those who watched a video after the symposium. Prof. Dongfeng Chen of AONSA President delivered the impressive and supportive message to us through internet in the beginning of the symposium. His message encouraged us and reminded us of the importance of our collaboration in AONSA.

ISSP:

Neutron Science Laboratory (NSL) of ISSP called proposals in last October and accepted 176 general user proposals and 13 Instrument and Research Team (IRT) proposals. The Proposal Review Committee meeting, which was held at



the end of January, approved all IRT and 107 general user proposals, keeping 69 proposals reserved. The overseas-experiment program, which has been continued for 10 years, will be finished in March, 2021.

*Osamu Yamamuro (ISSP, U. Tokyo),
Yoji Murayama (JAEA),
and Masayasu Takeda (JAEA)*

| Facility | | | Number of users | | | | | | | | |
|----------|--------------------------------|-------------|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | FY2011 | FY2012 | FY2013 | FY2014 | FY2015 | FY2016 | FY2017 | FY2018 | FY2019 |
| HFR | ILL | France | 3 | 9 | 0 | 4 | 3 | 1 | 0 | 3 | 0 |
| OPAL | ANSTO | Australia | 7 | 7 | 6 | 18 | 22 | 34 | 22 | 19 | 21 |
| HANARO | KAERI | Korea | 2 | 7 | 12 | 0 | 0 | 0 | 0 | 0 | 0 |
| FRM- II | MLZ (Munich) | Germany | | 4 | 1 | 0 | 8 | 1 | 7 | 2 | 2 |
| ISIS | Rutherford Appleton Laboratory | UK | | 4 | 4 | 4 | 4 | 0 | 4 | 3 | 1 |
| SINQ | PSI | Switzerland | | 1 | 4 | 5 | 6 | 1 | 3 | 4 | 0 |
| NBSR | NIST | USA | | | 7 | 13 | 5 | 2 | 11 | 6 | 4 |
| BER II | HZB (Berlin) | Germany | | | 2 | 0 | 7 | 3 | 2 | 2 | 2 |
| HFIR | ORNL | USA | 13 | | 1 | 1 | 1 | 6 | 4 | 7 | 0 |
| SNS | ORNL | USA | | | 4 | 2 | 1 | 5 | 6 | 1 | 0 |
| ORPHEE | LLB | France | | | 2 | 1 | 1 | 1 | 2 | 0 | 0 |
| Total | | | 25 | 32 | 43 | 48 | 58 | 54 | 61 | 47 | 30 |

Table 1. Numbers of scientists sent to overseas facilities since 2011 under Overseas-Experiment program of NSL-ISSP

Report from the Australian Nuclear Science and Technology Organisation

Australia's Open Pool Australian Light-water (OPAL) reactor is a state-of-the-art 20 Megawatt reactor that uses low enriched uranium (LEU) fuel to achieve a range of nuclear medicine, research, scientific, industrial and production goals.

The Australian Centre for Neutron Scattering (ACNS) operates the suite of neutron beam

instruments at the OPAL reactor and leads Australia in the use of neutron scattering and X-ray techniques to solve complex research and industrial problems in many important fields. There are currently 15 operating neutron beam instruments available for users.

Open competitive access to the neutron beam

instruments is available through the ACNS User Portal (<http://neutron.ansto.gov.au>). Calls occur biannually and close in 15th September and 15th March.

As detailed in the last AONSA newsletter, the OPAL long shutdown has been rescheduled to June 2021. The primary reason for the OPAL long shutdown is to replace the TG123 primary shutter which feeds neutrons to the thermal-neutron-beam instruments in the Neutron Guide Hall. To enable this work to occur with minimal impact on the reactor operation, the neutron-guide-hall instruments will be shut down from 8th May to early-August 2021, resulting in reduced numbers of days available for Neutron Guide Hall instruments in the 2021-1 round. The OPAL reactor schedule to the end of 2021 is available [here](#) and the ACNS instrument schedule can be viewed [here](#).

Further information on the ACNS activities can be found in the ACNS newsletter “Scatter Matters” [here](#).

A total of 331 proposals for cold- and thermal-neutron beam experiments were received for the 2021-1 proposal round with 120 proposals approved by the Australian Centre for Neutron Scattering & National Deuterium Facility Program Advisory Committee.

Jamie Schulz, ANSTO



A photo of the staff outside the beamhall at the Australian Centre of Neutron Scattering, ANSTO, 2020

Report from the National Facility for Neutron Beam Research

(India)



Neutron scattering instruments at Dhruva research reactor, BARC, Mumbai are extensively used by the scientists at BARC as well as by collaborators from universities and national institutes across India for studies of materials with a wide range of applications. As a part of the new development of the facilities, the High-Q diffractometer is being upgraded to improve neutron flux and Q-resolution by changing the monochromator geometry and collimation to study disordered crystals, in addition to the amorphous systems. The work is likely to be completed by mid-2021.

Using the existing neutron scattering facilities, a variety of samples have been investigated and results have been published in various international journals. References of some of these published papers are given below:

- 1) Magnetic Ground State of Geometrically Frustrated Quantum Magnets, Phys. Rev. B (Rapid Com.) 101, 140413 (2020), Phys. Rev. B 102, 134433 (2020);
- 2) Protein Structure and Interaction in Solution, IUCrJ 7, 166 (2020);
- 3) Interface Roughening in Shale Rocks, Int. J. of Coal Geo. 228, 103556 (2020);
- 4) Defects in Highly Neutron Irradiated Graphite from CIRUS Reactor, Phys. Rev. B 102, 064103 (2020).

The highlights of the findings on the neutron-irradiated graphite work, referred above, are presented below:

Defect Structure and annihilation mechanism of Neutron Irradiated Graphite

The irradiation of graphite in a nuclear reactor

results in a complex population of defects. Heating at high temperatures results in the annihilation of the defects with the release of unusually large energy called the Wigner energy. To understand the microscopic mechanism involved in the defect formation and annihilation on heating, the defect structure of graphite samples was modified by irradiation with neutrons at various levels of fluence over a period of almost 50 years in the CIRUS reactor at Trombay. These samples were then studied by neutron powder diffraction using the PD2 and the high-Q diffractometers at Dhruva Reactor. Complementary techniques x-ray diffraction (XRD), and Raman Scattering have also been used. Fig. 1 shows the neutron fluence as seen by various graphite samples.

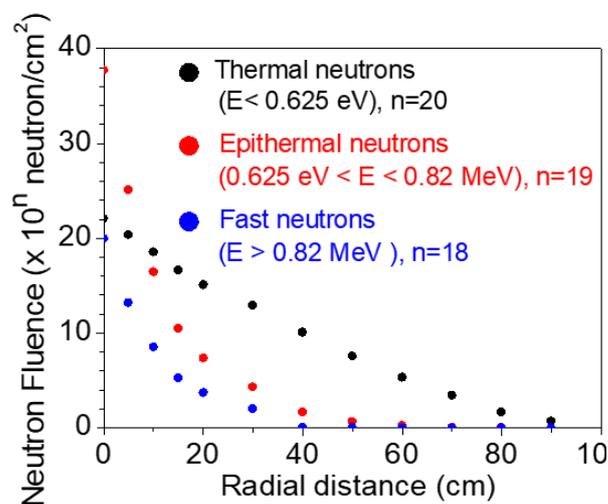


Fig. 1. Neutron fluence as seen by various graphite samples. The samples are located at various radial distances away from the reactor core. The radial distances of graphite samples are with respect to the sample which had seen the largest neutron fluence (at radial distance = 0

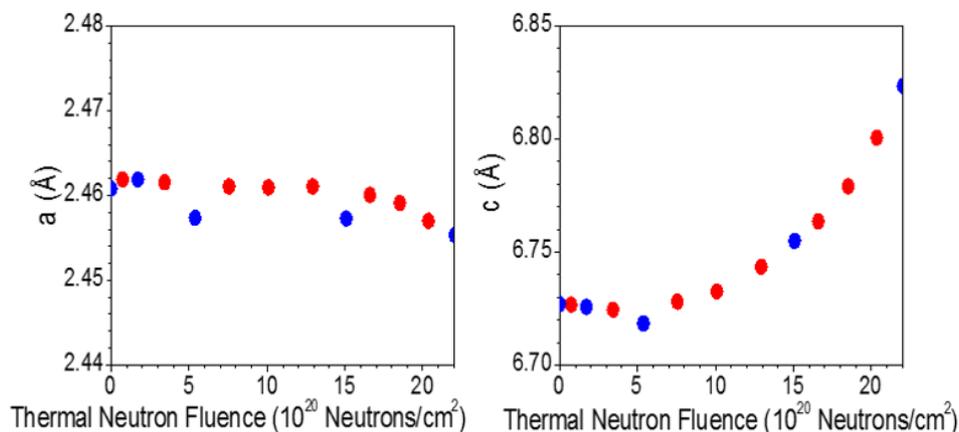


Fig. 2. Variation of lattice parameters with neutron fluence. Blue (from XRD), Red (from ND).

The data are analysed by *ab-initio* simulations. Some important results are given below:

It is found that the diffraction peaks of highly irradiated graphite samples are broader in comparison to those of an un-irradiated sample. It is inferred that larger-scale defects contribute to broadening of the diffraction peaks. Additionally, the peak positions are shifted towards a low-Q side with increase in the neutron fluence. The diffraction data were refined by the Rietveld refinement technique to obtain the precise lattice

parameters.

It is found that the *c*-lattice parameter undergoes a large expansion and the *a*-parameter shows a marginal contraction with the increase in neutron fluence (Fig. 2). This can be explained from the fact that the structure of graphite consists of van der Waals bonding along the *c*-axis, which is

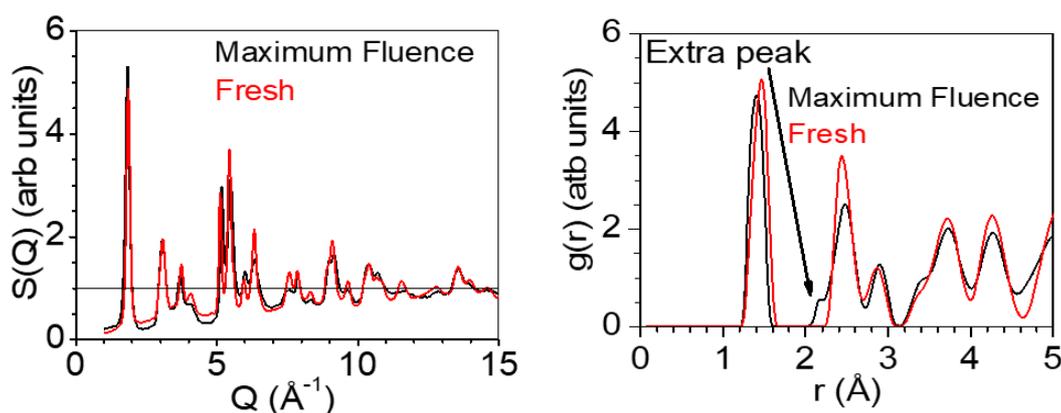


Fig 3 (a) Structure factor $S(Q)$ (b) pair distribution $g(r)$. Extra peak corresponds to C-C distance in deformed pentagon $l=2.06$ Å (see Fig. 4).

much weaker than the covalent bonding in the a - b plane

Fig 3(a) shows the structure factor obtained from the data measured on the high-Q diffractometer, which was analyzed by the Monte Carlo method to obtain the pair-distribution function $g(r)$ (Fig 3(b)). It can be noticed that the graphite sample irradiated with the maximum fluence shows an additional peak at $r = 2.06 \text{ \AA}$. *Ab initio* simulations show that the additional peak arises when an atom in the hexagonal layer is knocked out resulting in a deformed pentagon (Fig. 4).

Further *ab-initio* simulations showed the formation of Frenkel defects with various 2-, 3- and 4-coordinated topological structures at the atomic level in the defected graphites. It is suggested that the Wigner energy is predominantly stored in the interstitial atoms. Our work provides insights to understand the defect topologies and annihilation mechanism in graphite which is of considerable importance to the wider research area investigating graphitic materials including graphene and carbon nanotubes.

R. Mittal, M. K. Gupta, S.K. Mishra, S.Wajhal, H.K. Poswal, Baltej Singh, A.B. Shinde, P.S.R. Krishna, P.D. Babu, R. Mishra, P.U. Sastry, R. Ranjan and S.L. Chaplot, *Phys. Rev. B* **102** (2020) 6413.

S M Yusuf (NSSI)

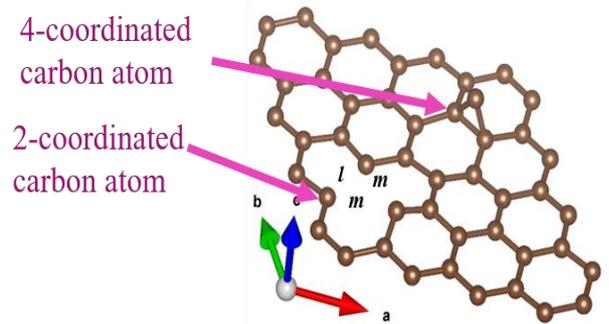


Fig 4. Picture showing graphite structure with displaced atom. Defected graphite has $l=2.06 \text{ \AA}$ and $m=2.66 \text{ \AA}$ reduced due to displacement of atom and shrinkage, while in fresh sample $l=m=2.44 \text{ \AA}$.

Report from the China Spallation Neutron Source

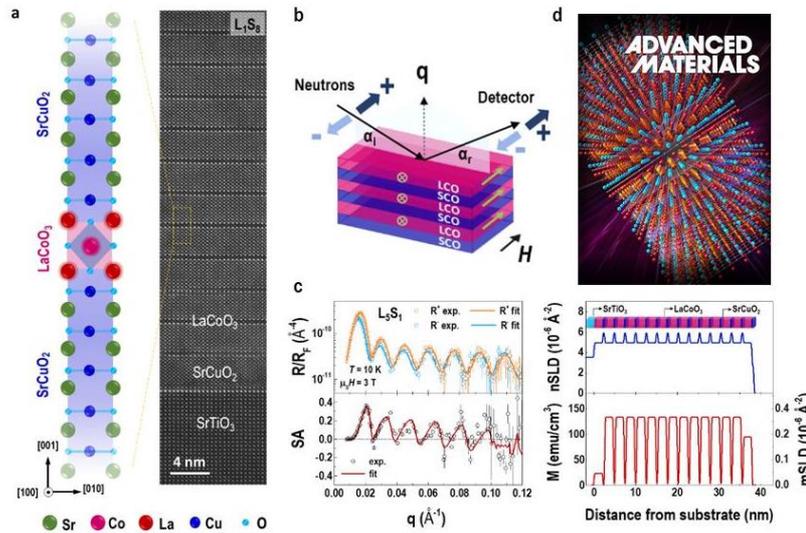


Figure 1. Structure and polarized neutron reflection spectra characterization of $[(\text{LaCoO}_3)_m/(\text{SrCuO}_2)_n]_{15}$ superlattice.

CSNS passed its design goal for acceptance on July 10, 2020. This is one and a half years earlier than the expected date. The power of the proton beam on the target is 103.87 kW, and the neutron efficiency is 0.16 n/p/sr, which exceeds the design parameter of 100 kW and 0.10 n/p/sr.

CSNS successfully completed the first target replacement. With the cooperation of related departments, the remote control maintenance and shielding group completed the decontamination and removal of the first target and installation of the second target in August. In the second target, the thermocouple has been imbedded into the first set of tungsten plates to test the new thermodynamic design for 500-kW targets. In September, the first target was placed in lead shielding drums and transferred to solid waste storage. The subsequent water and pressure conservation test on this new target with the cooling system showed a good sealing.

There were several research highlights from data taken at the CSNS. Jun Chen's team at the University of Science and Technology Beijing discovered the ultra-high energy density sodium-electric material $\text{Na}_4\text{MnCr}(\text{PO}_4)_3$. The hexagonal crystal structure was confirmed by Neutron diffraction (Advanced Materials 2020, 1906348). Panchao Yin's team of South China University of Technology prepared "hairy" nanoparticles of metal-organic polyhedrons with a clear structure and adjustable size. The study revealed the microphase structure of these novel particles using neutron scattering (Angew. Chem. Int. Ed. 2019, 25, 17412).

Quantitative characterization of the magnetic properties in thin films comprised of just a few atomic layers was performed using the CSNS reflectometer MR (Figure 1). The polarized neutron reflection spectra of LaCoO_3 ultrathin film and Ta/Co/CrN multilayers were measured.



The distribution and magnitude of the in-plane magnetic moments in the ultrathin films were confirmed, shining a light on the next generation of optical pumping and current-driven ultra-thin spin-orbit torque devices. The results were published in *Advanced Materials*, entitled "Strong Ferromagnetism Achieved via Breathing Lattices in Atomically Thin Cobalt Spheres" and "Strained-mediated High Conductivity In Ultrathin Antiferromagnetic Metallic Nitrides".

In other news, the committee members of the "Guangdong-Hong Kong-Macao Joint Laboratory on Neutron Scattering Science and Technology" attended the first video conference on July 31 to discuss how to arrange the collaboration and open projects. In September 12-13, the annual CSNS user conference was conducted online. In November 11-14, CSNS held a personnel meeting — the 8th National Neutron Scattering Conference — with nearly 300 experts from more than 80 universities, research institutions and enterprises in China. On December 17, the user conference on "Neutron Diffraction of Engineering Materials" was held in a combination of online and offline modes with

more than 300 scholars.

On October 21, Prof J R Zhang, deputy director of the Neutron Science Division of CSNS gave a lecture in Donghua Middle School, Dongguan, entitled "Neutron, Photon, Muon — a big device exploring a small world".

CSNS was awarded the honorary recognition as a "Radiation Safety and Protection Demonstration Unit " on August 18, by the Radiation Protection Association of the Guangdong Province.

Fangwei Wang, China Neutron Spallation Source

For questions, and submissions to the next issue of the AONSA newsletter, please contact the editor:

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