

## Introduction to the special issue for the 15th International Conference on Small-Angle Scattering (SAS2012)

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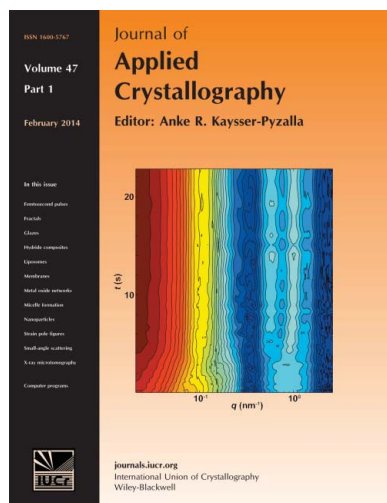
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The 15th International Conference on Small-Angle Scattering (SAS2012) was held in Sydney, Australia, from 18 to 23 November 2012 at the Sydney Convention and Exhibition Centre. There were 427 registrations from 28 countries with attendees submitting 498 abstracts across 16 themes. The conference Chair was Elliot Gilbert, ably assisted by Deputy Chair, Tracey Hanley, both from the Australian Nuclear Science and Technology Organisation. The Scientific Co-chairs were Jill Trehwella (University of Sydney) and Duncan McGillivray (University of Auckland), supported by Yoshiyuki Amemiya, Julie Borchers, Sung-Min Choi, Aldo Craievich, Kees de Kruij, Karen Edler, Andrew Jackson, Dale Schaefer, Dmitri Svergun and Andrew Whitten. For extensive reports on the conference, including special sessions, plenary speakers, prize winners, satellite meetings *etc.*, the reader is referred to Gilbert (2013) and <http://www.ansto.gov.au/Events/Eventsandresources/Past/SAS2012/index.htm>.

The scientific publishing landscape is changing. Over the past few meetings of the small-angle scattering community, it has become challenging for conference organizers to publish traditional volumes of proceedings in scientific journals without impacting on metrics of concern to many publishing houses, namely impact factor, despite an expressed need to have proceedings. Equally, many scientists would choose not to submit their findings to proceedings and wish to communicate their work in high-impact-factor journals only. From broadly canvassing the community, it has become evident that both proceedings and selected articles have their own rightful place and are valuable sources of reference for both the newcomer to the field and established researchers alike. As such, for the first time, the organizers of the small-angle scattering conference have published both proceedings (McGillivray *et al.*, 2012) – reflecting the full content of the meeting and reviewed to the extent that the work has been selected for conference presentation – and, here, a special issue in what many would consider to be the traditional and natural home for small-angle scattering, namely *Journal of Applied Crystallography*.

The production of this special issue has been a painstaking process. Attendees were invited to submit articles on the basis that, not only would their work be exposed to rigorous review but, even then, only selected articles would be published. The refereeing process was strict and thorough, many papers were rejected, and all were improved. We are grateful to all the authors that submitted material, whether selected or not, as well as the Guest Co-editors – Andrew Jackson, Yoshiyuki Amemiya, Charles Dewhurst, Dmitri Svergun and Aldo Craievich – the many referees for their invaluable effort which made the publication of this special issue possible and, indeed, the entire scientific programme committee that developed such a compelling programme. We would also like to thank Lisa Stephenson and Peter Strickland at the IUCr Editorial Office in Chester, UK, for their support and guidance. The resulting compilation provides an excellent overview of the state of the art across the spectrum of small-angle neutron and X-ray scattering (SANS and SAXS), covering the fields of application, theory, methods of analysis and instrumentation.

Kaneko *et al.* (2014) report on the application of time-resolved SANS to study guest-exchange processes in co-crystals of syndiotactic polystyrene. The use of scattering methods to investigate industrially relevant processing is described by Portale *et al.* (2013), with the application of combined small- and wide-angle X-ray scattering (SAXS/WAXS) to polystyrene, and by Hemmi *et al.* (2014) for stereo-complex crystals of poly(lactic acid) blends under shear flow. The influence of cationic and anionic blocks on



temperature-induced micelle formation is reported by Behrens *et al.* (2014), while the value of double-anomalous SAXS is highlighted in studying the internal structure of polymer micelles by Sakou *et al.* (2013).

Scattering methods find broad technological application, and Gebhardt (2014) describes how grazing incidence can be employed to investigate the effect of filtration forces on the, albeit misnamed but ubiquitous, food-relevant structure of casein micelles. Continuing with a broad food theme, Diat *et al.* (2013) show how octanol-rich and water-rich domains exist in dynamic equilibrium in the pre-ouzo region of ternary systems containing a hydrotrope.

As far as medicine and healthcare are concerned, liposomes have widespread use as delivery vehicles for biologically active compounds including drugs. Varga *et al.* (2014) describe the use of time-resolved SAXS to reveal osmotic shrinkage of sterically stabilized liposomes, while Chen *et al.* (2013) study polymer-embedded hollow nanoparticles with particular focus on their shell porosity. At the interface of complex fluids and magnetism, Jain *et al.* (2014) apply SANS to study the forces between magnetically chained ferrofluid emulsion droplets.

The triblock copolymer F127 has been investigated by both Kim *et al.* (2014) and Bogomolova *et al.* (2013) using SANS and SAXS, respectively. Bogomolova *et al.* (2013) combine SAXS with light scattering to study hybrid nanoparticles of F127 with hydrophobically modified polyoxazolines, while Kim *et al.* (2014) address self-assembly induced by additives and temperature. Small-angle scattering spans far and wide, and Segad (2013) shows the critical role that SAXS plays in the microstructural characterization of clays from Iraq.

The use of anomalous SAXS (ASAXS) methods continues to grow. In addition to the application to polymer micelles reported by Sakou *et al.* (2013), Hoell *et al.* (2014) report on the use of ASAXS to study calcium fluoride nanoparticles embedded in a silicate glass matrix, while Haas *et al.* (2013) combine ASAXS with UV-Vis spectroscopy to highlight catalysis in gold/palladium nanoclusters. ASAXS also finds application to hydrogen storage materials in the form of a calcium reactive hydride composite as reported by Karimi *et al.* (2014).

Small-angle scattering encompasses families of techniques, and no further evidence of this is needed when one considers the independent studies of anodic alumina interfaces. Small-angle X-ray diffraction mapping has been applied by Roslyakov *et al.* (2013) to study the longitudinal pore alignment in films grown on polycrystalline metal substrates, while X-ray and neutron reflectivity as well as ultra-small-angle X-ray scattering have been employed by Hu *et al.* (2013) to probe interfacial morphology. The use of grazing-incidence SAXS (GISAXS) extends beyond casein micelles, with Bernstorff *et al.* (2013) and Sarkar *et al.* (2014) employing GISAXS to probe cobalt nanocrystals in amorphous multilayers and metal oxide network morphology, respectively.

The ever-increasing role of scattering across diverse disciplines and materials relies on the continued development of theory and instrumentation. Many in the community have applied indirect Fourier transform (IFT) methods to extract

valuable information from their data; however, this approach has traditionally been limited to isotropic scattering. Fritz-Popovski (2013) presents here an extension of the IFT method (and software) for two-dimensional small-angle scattering data. Alves *et al.* (2014) describe how high-symmetry nanoparticles may be modelled by small-angle scattering. In the area of instrumentation, Rehm *et al.* (2013) report on the new USANS instrument, Kookaburra, at the OPAL reactor in Australia, and, last but certainly not least, Rennie *et al.* (2013) describe the latest findings from round-robin measurements conducted on both SANS and SAXS instruments across the world.

With this rigorous selection process applied, we trust that this special issue and the 24 selected articles, representing the work of 138 individual co-authors, will provide a valuable reference for many years to come. The issue is available at [http://journals.iucr.org/special\\_issues/2014/sas2012/](http://journals.iucr.org/special_issues/2014/sas2012/).

The next conference, SAS2015, will be held in Berlin and will mark the 50th anniversary of the SAS conference series. We wish the organizers of this meeting and the following (SAS2018), to be held in Traverse City, Michigan, USA, best wishes for their respective conferences.

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