

Welcome from the Chair

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Dear members

As the new chair of the group, I am delighted to have the opportunity to welcome you to the 2017 winter newsletter from the Thin Films and Surfaces Group (TFSG) of the IOP.

As many of you know, last year the Engineering and Physical Sciences Research Council (EPSRC) commissioned a review of all the subject areas they fund, known as the Balancing Capabilities exercise. They solicited evidence from a variety of sources, including learned societies. The TFSG (mainly through extensive work by our previous chair, Dr Neil Curson) submitted a 17-page report in support of the surface science community, and members also attended an EPSRC Surface Science Focus Group. The well-deserved outcome is that **the priority of 'Surface Science' has been increased**, which dramatically improves our funding outlook. I take these changes as clear recognition of both the technological and fundamental importance of our field. Given this increase in funding priority, we have a tremendous new opportunity to apply our techniques and methodologies to the many emerging challenges at surfaces - we are at an exciting moment!

Looking forwards at a group specific level, **I would like to ask the group membership for suggestions on where the group can further support your professional activities.** The newsletter gives an overview of what we do at the moment and we have discussed several new ideas, including a database of expertise,

further one-day meetings, greater opportunities for student involvement with the group, and on a larger scale, looking towards establishing a UK Surface Science network. If you have ideas, requests, or would like to get involved with the TFSG (we are very keen for involvement of enthusiastic members at all levels), please contact me.

In the rest of these pages, we are able to report on a number of the group's activities in 2017, and to publicise forthcoming ones. The highlight of the year was the bi-annual Interdisciplinary Surface Science Conference, which was held at the Royal Northern College of Music in Manchester from 10-13 April 2017. The event was a great success and involved an outstanding array of invited speakers covering all experimental and theoretical aspects of surfaces, interfaces and nanoscale physics and chemistry. One of my personal favourites was the excellent talk given by Mark Golden on Topological Insulators, which many colleagues commented was the 'best they had seen' in this very active area. More details, along with the highlights of the multiple smaller meetings that the group supported financially are described below. Next year, we look forward to the nanoScience@Surfaces summer school, which will again be held at the Cavendish Laboratory, Cambridge, between 30th July and 2nd August 2018, and which we hope will be similarly successful to the event in 2016.

Finally, please do take a look at the newsletter sections on the **TFSG Lecture Series**, the



TFSG Student Bursaries, and the **Woodruff Thesis Prize**. These are all great opportunities for obtaining funding and recognition of exceptional research in a recent PhD thesis.

Best wishes,

Andrew Jardine (Chair of the TFSG)

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Reports on Meetings Organised by the TFSG

Interdisciplinary Surface Science Conference (ISSC)

The biennial flagship TFSG conference Interdisciplinary Surface Science Conference was held at the Royal Northern College of Music in Manchester from 10-13 April 2017. The meeting attracted around 100 delegates, with high profile invited speakers from Europe, the UK and the USA. Sessions focussed on synchrotron radiation for surface analysis and structure determination, self-assembly at surfaces, nano- and 2D materials and electrochemistry. The Royal Society of Chemistry, Solid Surfaces Group sponsored a special session on applications of surface science to corrosion. For the first time we also had an invited talk from the winner of the previous year's Woodruff Thesis Prize winner. This was given by Dr. Hannah Aitchison, covering her PhD work on the self assembly of molecules silver and copper modified gold surfaces.

There were over 30 contributed talks on subjects from fundamental work on He ion scattering to applied studies of corrosion of steel in seawater. Poster sessions were held on the Monday and Tuesday evening, and a prize for the best student poster was awarded to Pavel Kliuiev of the University of Zurich. It was a difficult decision with some outstanding posters and presentations on display, an encouraging sign for the future of surface science.

In addition to the science program we had a good range of commercial exhibitors with Specs, MolecularSpray, Scienta Omicron, Mantis Sigma, Japan Vacuum Instruments, Henniker Scientific and Hiden Analytical in attendance.

The conference meal was held at Zouk, an Indian restaurant on the edge of the city centre and was thoroughly enjoyed by all who attended.

The chairs would like to take this opportunity to thank Joanne Hemstock and Dawn Stewart of the IOP conferences team and also the staff of the RNCM team who helped make the event a success. Most of all we would like to thank all of the speakers, poster presenters and delegates, without whom the conference would not have taken place.

Andrew Thomas and Rob Lindsay

(ISSC co-chairs)

Announcement:

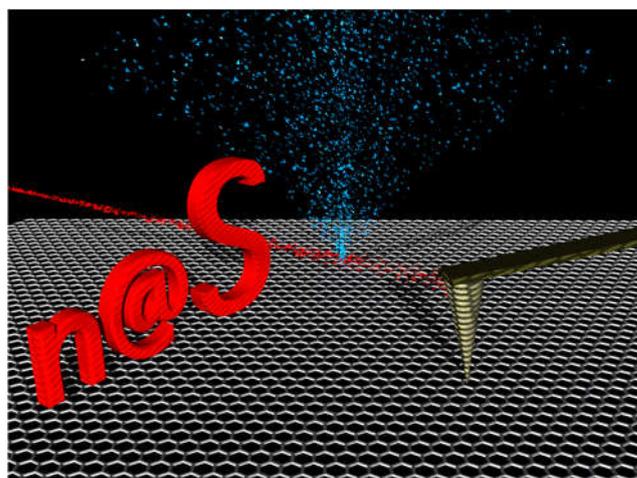
Summer School on nanoScience@surfaces 2018

Following the success of the Summer School on nanoScience@surfaces in 2016 the Thin Films and Surfaces Group, Structural Condensed Matter Physics Group, Vacuum Group, and Nanoscale Physics and Technology Group will organise a second meeting: 30th July - 2nd August 2018. The summer school will cover key aspects of surface analysis and surface science including spectroscopy, microscopy and theoretical approaches to understanding fundamental processes occurring at surfaces on the nanoscale.

The summer school will be held in Cambridge again with accommodation at Murray Edwards College and meals both included in the registration fee. Although the fee has not yet been finalised we aim to keep it as low as possible. Further details on registration will be circulated by the Institute of Physics early in the New Year.

Confirmed speakers include:

- Phil Woodruff (Warwick)
- Bill Allison (Cambridge)
- Wendy Flavell (Manchester)
- Rob Jones (Nottingham)



If you have any ideas for future meetings, please contact the group chair, Dr Andrew Jardine (apj24@cam.ac.uk).

Reports on Meetings Sponsored by the TFSG

Plasmas, Surfaces and Thin Films: Early Career Researchers Meeting

The annual meeting, plasmas, surfaces and thin films was held in Loughborough on June 22 2017. There were 36 delegates at the meeting with 5 invited talks from senior scientists, 8 talks by young researchers and 12 poster presentations. The IPSI poster prize was won by Juliet Ojiako for her work on investigating plasma interactions with liquids.

The programme for the meeting is given below. There was a strong energy materials emphasis from MAX phases and high entropy alloys to diamond, Solgel and Cadmium Telluride thin films. The standard of the oral presentations by the young researchers this year was especially high. Further information about specific presentations can be obtained from the meeting organiser Roger Smith: R.Smith@lboro.ac.uk

Invited talks by established Researchers

10-30 Christian Bradley, Tokamak Energy, UK, Plasma Challenges and Glow Discharge Vessel Conditioning in the Tokamak Energy ST40

11-00 Chris Walker, Diamond Hard Surfaces Ltd, Diamond Hard Surfaces; Successful technology implementation; from idea to commercial success

11-30 Ben Beake, Micromaterials, Improved characterisation of DLC coatings for automotive applications

12-00 Konstantza Lambrinou, SCK-SEN, Belgium, Radiation damage to materials and developments towards next generation of nuclear reactors

12-30 Houzheng Wu, Department of Materials, Loughborough University, Microstructure and mechanical property characterisation of zirconium nitride, carbide and boride after heavy ion irradiation

Young Researcher talks

14-10 David Shaw, University of York, Modelling deposition removal from fusion optics

14-25 David Meehan, University of York, Laser Ablation of metal and metal-oxide targets, and applications towards Plasma Enhanced-Pulsed Laser Deposition

14-40 Aisyah Zanai, University of Surrey and Plasma Quest Ltd., An introduction to Hiatus Technology with application to Multilayer depositions

14-55 Sibel Yilmaz, CREST, Loughborough, The microstructure of CdS/CdTe solar cells fabricated using magnetron sputtering.

15-30 Gerald Womack, CREST, Loughborough, The design, performance and durability of broadband anti-reflection coatings for solar modules deposited using magnetron sputtering.

15-45 Mateus Tunes, University of Huddersfield, Ion beam sputter-deposition of high-entropy alloy thin films on zircaloy-4 for potential use in accident-tolerant fuel systems

16-00 Adam Bennett, Cranfield University Atmospheric pressure plasma technology for ultra-precision engineering of optics for applications in aerospace, defence and science

16-15 Jingcheng Guan, Department of Materials, Loughborough University, Atomistic modelling of zinc oxide thin film growth by different deposition techniques

POSTER PRESENTATIONS

1 Stuart Robertson, Loughborough University, Structure and mechanical performance characterisation of zirconium nitride after heavy ion irradiation

2 Chris Chalmers Loughborough University, Modelling the dewetting of inkjet printed drops

3 Carmen Alonso Herr Oxford University, Deposition of organic layers by roll-to-roll coating in vacuum

4 Benjamin Maerz Loughborough University, Microstructure of Isostatic Pressure-Moulded Graphite (Iso-Graphite)

5 Wilhelm Huettene, Cambridge University, Sustainable magnetostrictive thin film alloys

6 Michael Watts, Loughborough University, Understanding CdTe/CdS solar thin film structures through ab initio modeling

7 Faraz H. Montazersadgha, Loughborough University, Space Averaged Mathematical Model of Pulse Powered Atmospheric Pressure Air Plasma

8 Juliet Ojiako, Loughborough University, First steps in modelling plasma interactions with liquids

9 O. Ogunyinka, Loughborough University, Enhancement of mass transfer rate of plasma reactive species in gas-liquid phases with a Microfluidic plasma reactor

10 Alec Wright, Loughborough University, Development and Comparison of Ozone Measurement Techniques

11 M. Shaban Loughborough University, Plasma liquid interface using a microfluidic plasma device

12 Doga Billcan, Barcelona, Synthesis of Porous BiFeO₃ films with Ferromagnetic-like Behaviour by Electrodeposition followed by Heat Treatment

Reports on Meetings Sponsored by the TFSG

High-pressure XPS of Energy Materials 2

The 2nd one-day conference on High-pressure XPS of Energy Materials (HP-XPS-EM2) was held in the Keighton Auditorium at the University of Nottingham on the 20th September 2017. The meeting was organised by James O'Shea on behalf of the University of Nottingham Energy Technologies Research Institute (ETRI) and the IOP Thin Films & Surfaces group, and supported by the IOP Nanoscale Physics group, and Scanwel/SPECS. Around forty people attended all or part of the meeting throughout the day, ranging from PhD students to senior academics. Kicking off proceedings was the plenary lecture of Andrew Thomas from the University of Manchester, presenting recent near-ambient pressure XPS results in the areas of solar energy and carbon capture and storage. The rest of the day included talks from academic and industry researchers on new developments in the x-ray photoelectron spectroscopy of the solid-liquid interface, fuel cells, solar water splitting, organic molecules, and x-ray absorption spectroscopy at near ambient pressures. The meeting concluded with a discussion drinks reception.

James O'Shea



Thin Film and Coating Technologies for Science & Industry



Growing interest in thin-film and coating sciences at the UK's annual meeting

This year the Thin Films and Surfaces Group chose to support the annual '**Thin Film and Coating Technologies for Science & Industry**' October meeting at Coventry, a meeting within the Vacuum Symposium co-located with the Vacuum Expo exhibition. This annual meeting differs from the typical academic get-together being held at a venue where academic scientists and industry technologists can meet and network.

The meeting included top scientists from around the UK and one USA based speaker, David Sanchez from Materion Corporation.

Commenting on the meeting Dr Hayley Brown (Plasma Quest Ltd), who has sat on the organising committee since inception of the meeting seven years ago, reflected that she felt that the meeting was the best yet, being technically very high level and relevant to her in her work. She cited one of the presenters, Chris Walker of Diamond Hard Surfaces, as giving a particularly interesting talk on CVD amorphous diamond coatings for extreme performance applications.

Built into the program was time for attendees to visit the exhibition and a Poster Session combined with other meetings, bringing 20 posters papers to the event, presented by early career scientists, MSc and PhD students.

The programme remains on the website and people interested in the next meeting on the 10th October 2018 are urged to subscribe for updates at: www.vacuum-expo.com.



Reports on Meetings Sponsored by the TFSG

Surface Science: Beyond UHV

On Friday 20th January 2017 the solid surface group (SSG) of the Royal Society of Chemistry (RSC) organised a 1 day symposium entitled "Surface Science: Beyond UHV" held at Burlington House in London. The primary aim of this symposium was to showcase current research that goes beyond ultra-high vacuum conditions traditionally used in surface science to investigate systems at high pressures and even in liquid environments. The meeting was attended by 58 delegates and had invited presentations from Prof Stuart Clarke (University of Cambridge); Prof David Payne (Imperial College); and Prof Manfred Buck (University of St Andrews). Prof Clarke described his research using neutron reflectometry to study the self-assembly of a wide range of different molecular and macromolecular adsorbates at liquid-solid interfaces. Prof Payne presented the recent challenges and opportunities resulting from his development of laboratory-based high pressure photo-electron spectroscopy (PES). Finally, Prof Buck described his work on the use of scanning tunnelling microscopy (STM) and electrochemical techniques to study the self-assembly of two-dimensional porous molecular networks at solid-liquid interfaces. In addition to these invited talks a number of talks and posters were presented by PhD students and PDRAs from several UK based research groups. These presentations covered a broad range of topics from molecular resolutions AFM in ambient conditions to helium atom microscopy. The organisers of the meeting were grateful for sponsorship from the Thin Films and Surfaces Group of the Institute of Physics (IoP), Scanwel Ltd; Hiden Analytical Ltd and SPECS GmbH.

Matthew Blunt

26th ISO/TC 201 Surface Chemical Analysis Meeting and its Subcommittees

21 to 23 Sept 2017, National Physical Laboratory, Teddington, UK

This was held at National Physical Laboratory and kindly supported by a number of generous sponsors. Without this funding the meeting could not have taken place in the UK. There were 9 sub-committee meetings covering terminology, general procedures, data management and treatment, depth profiling, secondary ion mass spectrometry, electron spectroscopy, glow discharge spectroscopy, scanning probe microscopy X-ray reflectometry and X-ray fluorescence as well as study groups on biomaterials analysis, optical interface analysis and nanomaterials characterisation.

For this work, there are currently 14 participating countries, 14 observing countries and 6 liaison groups including VAMAS, IUPAC. The 3 day meeting was attended by 80 delegates from China, Germany, Italy, Japan, Korea, Mexico, Sweden, Switzerland, UK and USA including 20 delegates from the UK. A big thank you to all the sponsors for your generous support for this meeting.

Charles Clifford



Thin Films & Surfaces Lecture Series

The Thin Films and Surfaces Group (TFSG) Lecture Series enables universities in the UK to bring a European or international inspirational surface scientist to give a lecture at their institution, open to all the surface science community to attend free of charge.

We are looking to entice the 'big names' in our field and promising Early Career Researchers. The lectures should be aimed to a wider audience beyond a narrow sub-field will be publicised to all members of the Thin Films and Surfaces Group of the IOP and must be open to attendees outside of the host institution (subject to the capacity of the available venue).

To facilitate this series, funds can be requested from TFSG to contribute towards the travel costs of the invited speaker. Groups inviting Early Career Researchers to present their work are particularly encouraged to apply.

The call for funding for 2018 is now open and applications will be presented to the IOP General Fund, provided they meet the rigorous standards of the call and are approved by the TFSG Committee. For this round, funds of up to £300 for a speaker from Europe, or £500 for an international speaker may be applied for.

Application forms can be requested from the Chair of the TFSG, Dr Andrew Jardine (apj24@cam.ac.uk)

Woodruff Thesis Prize 2016: Winner

The 2016 Woodruff thesis prize (awarded for a thesis submitted in the 2016 calendar year) has been awarded to Dr Alexander Rosu-Finsen from Heriot-Watt University, with a thesis entitled “Icy Dust Grains in the Interstellar Medium: Their Properties and Impact”.

Dr Rosu-Finsen’s thesis explores the behaviour of simple atoms and molecules on the surface of model interstellar dust grains and interstellar ice analogues. Icy film growth by reactions at the gas-solid interface, morphological evolution of ices and desorption from both bare grains and ices themselves in the interstellar medium (ISM) couple the complex and rich chemistry observed in the astrophysical gas-phase to the catalytic activities of the grains. Therefore, thin film

growth and desorption behaviour of simple molecules have been studied by means of surface science techniques, utilising mass spectrometry and infrared spectroscopy, in order to understand the physiochemical processes and intermolecular interactions in model interstellar ices. The systems of interest comprise a silica surface, representing the bare grains in the ISM; films of water (H₂O) and carbon monoxide (CO); and gaseous beams of oxygen atoms (O) and molecules (O₂). The results of the experimental work are placed in the context of their potential impact on the astrophysical environment and the star-formation process



Dr Alexander Rosu-Finsen

Winner of the 2016 Woodruff thesis prize

Woodruff Thesis Prize 2017: Call for nominations

The Woodruff thesis prize is awarded annually by the Thin Films and Surfaces Group (TFSG) of the Institute of Physics (IOP) for the best PhD thesis completed by a student member of the TFSG in the stated year. The prize is £200 and an associated certificate. Nominations must be made using an application

form that can be obtained from the TFSG group website (http://www.iop.org/activity/groups/subject/tfsg/prize/page_50366.html) and submitted to the Chair of the TFSG (Andrew Jardine, email apj24@cam.ac.uk) at any time before the closing date of **30th April 2018**. In addition to the application form, an electronic

copy of the thesis should be submitted, with a small section identified that represents the highlight of the thesis. The qualifying period is the calendar year 2017 during which time the thesis must have been successfully examined for a PhD (theses originally submitted in 2016 are therefore eligible if the viva date was during

2017). The final version, including any minor corrections, must have been submitted before the competition closing date. Please note non-TFSG/non-IOP members can be nominated for the prize provided they are nominated by an IOP member.

TSFG Student Bursaries

The Institute of Physics (IoP) provides financial support to research students to attend international meetings and major national meetings.

The Institute of Physics handles the application process but it is the relevant IoP group that makes the decision on whether to award the bursary and its value.

Research Student Conference Fund (RSCF) bursaries are available to PhD students who

are a member of the Institute and of an appropriate Institute group.

Students may apply for up to £250 during the course of their PhD and may apply more than once, for example they may request the full amount or decide to request a smaller amount and then apply for funding again for another conference at a later stage.

Note that grants will normally cover only part of the expenses incurred in attending a conference and are intended to supplement grants from other sources.

For details and application form please look at the information for students on the iop.org website.

All recipients are asked to produce a report on return from their conference before receiving payment.

“Research Student Conference Fund (RSCF) bursaries are available to PhD students who are a member of the Institute and of an appropriate Institute group.”

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