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Ion & Plasma Surface Interactions Group

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* Students may now apply for up to £300

Welcome to the Ion and Plasma Surface Interactions (IPSI) Group Newsletter

A message from the Chair:

It was with great pleasure that I recently took on the position of Chair of the Ion and Plasma Surface Interactions group committee – and a little trepidation. The previous chairs that I have worked with, Zoe Barber and Alan Webb, both did an excellent job and will be tough to follow. I think it is appropriate for me to begin this, my first Chair's message, by thanking Alan on behalf of the committee and the wider IPSI group for all he has done on his latest three-year stint at the helm, and for his continuing support.

A number of changes in committee “personnel” have occurred since the last newsletter. Brian Jones, the committee secretary, and Yolanda Gonzalvo both left due to relocation overseas. Their work on the committee was very much appreciated, and we wish them well. In their place, we have been joined by Hayley Brown and Chris Jeynes (both from the University of Surrey), Vladimir Vishnyakov (Huddersfield) and Eric Wagenaars; I'm sure each of them will be an asset to the committee. Adam Brierley has kindly taken on the position of Secretary following Brian's departure.

Such is the seemingly magnetic attraction of working with the IPSI committee, that no sooner had Alan completed his second period of office as returning chair and relaxed into ordinary membership, but our former secretary Brian Jones has returned to the UK eager to help out once more. Brian has very kindly offered to resume the role of editor of our newsletter, which is very much appreciated by all. He will also be joining us as a co-opted member at our committee meetings. Also co-opted is Sabrina Blackwell (TWI, Cambridge), who we look forward to working with.

Over the past twelve months, the IPSI group has supported a number of meetings and other events, both in terms of organisation by committee members, and through financially supporting events of interest to the group - although this has been somewhat constrained by current IoP financial regulations! Details of these activities will follow in the remainder of this newsletter. It is our hope that we can continue to support a range of activities via participation, organisation, informing the wider community and via financial support. The committee is here to serve the group, so I would ask members to send any suggestions of how we can support the ion and plasma surface interactions community to us for consideration. We are here for our members, so please let us know of anything that you think would be of interest to your peers; and how we can offer the best service as your committee.

Glen West (IPSI Chair)

Remarks from the Past Chair:

After three years as IPSI Chair I thought it time to stand down to make way for fresh ideas and a new face to take the helm ! For those that were not at the hand over and to all the IPSI members, I would like to reiterate my outgoing remarks.

It is the committee that makes the chair's position a comfortable one and with that, I thank the members of the committee over the time I have been in the chair.

The organisation of the various technical meetings and the secretarial help have all been outstanding, together with our continuing close collaboration with other Groups. Dealing with the financial matters has always been a trying experience, and although HQ tell us that systems are in place to improve things, we still hear problems with regards timely statements. James Walsh has dealt with all the issues in a very efficient manner.

New members have joined the committee this year and I'm sure that they will continue the high standards and with our new chair Glen West, I leave, knowing we are in safe hands.

Alan Webb (Former IPSI Chair)

IPSI News & Events

Plasmas, Surfaces & Thin Films

19th June 2014, 28 Portland Place, London, UK

The meeting this year was held at 28 Portland Place due to the Institute of Physics building being unavailable. There were thirty-nine registered participants with two overseas speakers. The event has traditionally been the venue of the IPSI group annual meeting. The oral programme is set out below. Three of the four morning talks were given by expert women scientists. There were also six poster presentations.

Understanding plasma etching mechanisms for III-Vs: ICP etching of InP and related compounds for photonic devices

S Bouchoule, CNRS, France

Control of reactive species in atmospheric pressure plasmas

D O'Connell, University of York, UK

Size effects in the mechanical properties of thin optical coatings on glass: Real phenomena or measurement artefacts?

S Bull, University of Newcastle, UK

Complex oxide heterostructures by pulsed laser deposition

J Kleibeuker, University of Cambridge, UK

Annual General Meeting of the Ion and Plasma Surface Interactions Group

All IOP members were invited to attend.

Vacuum deposited MAX phases and complex carbides

V Vishnyakov, Manchester Metropolitan University, UK

Single nanometre and 450mm silicon - two ends of the scaling challenge

M Cooke, Oxford Instruments, UK

In-situ ion irradiation of solids in a transmission electron microscope

S Donnelly, University of Huddersfield, UK

Using on-the-fly kinetic Monte Carlo method to model CdTe thin film growth

M Yu, Loughborough University, UK

Nanostructuring by swift heavy ions and/or laser ablation in semiconductors

A P Pathak, University of Hyderabad, India

High rate deposition of thin film CdS for solar cells by pulsed dc magnetron sputtering

F Lisco, CREST Loughborough University, UK

High efficiency hollow cathode plasma source providing operation at low process pressure

D Child, University of the West of Scotland, UK

New circular ion sources for fast process development

H Li, Gencoa Ltd, UK

The quality of the talks was quite good with a total of three research students giving talks. The talk on pulsed laser deposition indicates that the group will place more emphasis on this technique over the coming year. One of the new committee members elected at the AGM is working in this area.

The feedback from the meeting was not entirely positive, although most of the comments related to the venue and lunch. It was felt by some participants that the venue was not as suitable as the IOP headquarters (reasons given : traffic noise, uncomfortable chairs or poor lunch) and others felt that the meeting was too expensive. The committee will therefore discuss options for the meeting in future, such as making it a biannual event or having the venue outside London to reduce costs.

IPSI Group Poster Prize awarded during PSTF 2014

The Ion and Plasmas Surface Interactions Group Poster Prize is presented during the IPSI Group's annual Plasmas Surfaces and Thin Films meeting. The meeting took place this year on Thursday 19th June with a full programme of 12 oral papers and 6 poster presentations. Students attending the event are encouraged to present a poster on their research work, relevant to the general field represented by the Ion and Plasma Surface Interactions Group.

All posters for which the 1st author is a student (registered for the event) are judged on the basis of scientific content, effectiveness of communication and overall appearance, by independent judges and a £100 prize is awarded to the winner, together with a certificate. The Group Prize was won by Camille Piebac, a PhD student from Manchester Metropolitan University, with a poster entitled “Nanostructure influence on toughness of Cr₂AlC thin films“. Supporting students is of key importance to the Group.



The IPSI Group Poster Prize being presented to Camille Piebac

Surface Modification and Analysis

15th October 2014, The Ricoh Arena, Coventry, UK

Organised through the Ion and Plasma Surface Interactions, Materials and Characterisation, Nanoscale Physics and Technology, Thin Films and Surfaces and Vacuum Groups as part of the Vacuum Symposium 5 (VS-5)

Invited Speakers from National Research Laboratories and Universities in the UK, Germany and Austria presented latest information on many aspects of surface modification and analysis.

Contributions on surface modification covered atomic layer deposition with plasma-assistance to form dielectric layers in high electron mobility transistors, power electronic devices and solar cells, coatings inside vacuum tubes to provide pumping and low electron-emission surfaces and manipulation of atoms such as hydrogen on a surface to control the action of a functional molecule.

Developments in analytical methods included measurement techniques to determine mechanical properties of a multilayer or multi-component system, measurement of biomolecular interface properties of importance in the performance of nanoparticle drug delivery products, improved interpretation methods for interpretation of scanning tunnelling data, modified tips and frequency modulation in atomic force microscopy to bring resolution to the pico-meter scale and an in-air particle-induced x-ray emission analysis technique which has provided data allowing reconstruction of the original image in a old stained-glass window.

In addition, a talk tracing latest modelling methods of film deposition by energetic particles was given combining molecular dynamics and the so-named “on-the-fly” Monte Carlo technique. Several videos illustrating the predicted growth modes of films were shown and it is clear that such models offer an important insight into the influence of deposition parameters on film growth.

The meeting attracted over 60 delegates who also enjoyed the equipment exhibition during the refreshment and extended luncheon breaks. Several Poster presenters gave a 2 minute presentation on their work at the end of the main morning session. The annual Vacuum Group poster prize was presented in the exhibition area. The 2014 prize was won by Holly Hedgeland for her poster on “Quantum States and Molecular Structures on Silicon”

Thanks are due to all speakers and to Sue Waller and Marie White from STFC Daresbury who prepared the booklets and dealt with the registration. We also acknowledge and thank all the Exhibitors and STFC whose support for the event allowed delegates to attend this scientific meeting free of charge.

John Colligon

5th International Conference on High Power Impulse Magnetron Sputtering

30th June to 3rd July 2014, The Cutlers' Hall, Sheffield, UK

Hosted by Sheffield Hallam University and Fraunhofer Institute for Surface Engineering (IST) and supported by the Ion and Plasma Surface Interactions Group

The meeting attracted 120 delegates from academia and industry in equal numbers. The scientific program was strong with 30 oral presentations and 10 posters from established and fresh research groups working in the field from around the world. Discussions focused around the importance of plasma self-organisation and power delivery for the plasma chemistry and energy of ions and presented modelling results.



The HIPIMS delegates

Microstructure evolution of thin films under HIPIMS conditions was discussed extensively. The growth of oxide semiconductor and insulating films was one of the hot research topics with emerging industrial interest. Coatings for fusion reactor walls, particle accelerators, tribological systems and corrosion systems were discussed as well. In a dedicated section of the program industrial companies presented the latest advances in production scale systems and end-users shared their experience in industrial exploitation. An exhibition accompanied the technical sessions and included 26 companies involved in the

production of HIPIMS hardware, process design and endusers of the technology. A program of three short courses was delivered by the Society of Vacuum Coaters – the main sponsor of the conference.

An important announcement was made by Ionbond's CEO regarding the establishment of the largest HIPIMS production facility in UK. The next issue of the conference will be held in Braunschweig, Germany on 10-11 June 2015.

Further information on future and past meetings can be obtained on the conference website: <http://www.hipimsconference.com/>

IPSI Group Outreach Activities

Plasma & Light Public Outreach Event

30th March to 2nd April 2015, The Open University, UK

As part of the Open University's hosting of the 42nd Institute of Physics Plasma Physics Group Annual Conference, taking place between Monday 30th March - Thursday 2nd April 2015, an outreach event is being organized.

This is inspired by The United Nations General Assembly proclamation that 2015 will be 'The International Year of Light' (<http://www.light2015.org/Home.html>). The focus of this outreach event is how plasmas and light have become part of our daily lives. This public outreach event will be taking place on the afternoon and evening of Tuesday 31st March 2015, and will be held in the Berrill Building on The Open University Campus.

The programme will include a table top exhibition in the Berrill foyer followed by four general interest talks in the Berrill Theatre on aspects of plasmas and light. Both sessions will be open to the public and will be free of charge. The IPSI Group are delighted to be involved and are actively sponsoring this event.

Local Organisers: Professor Nicholas Braithwaite and Dr Alan Webb

IPSI Group Outreach Experience

These following articles have been written by IPSI Group members to highlight the benefits of science outreach. Our members are encouraged to contribute their outreach stories to the IPSI Group newsletter.

(please submit ideas to the newsletter editor: B.N.Jones@Sussex.ac.uk)

An energetic walk to work

On 12th November, I had a new and interesting working experience. A former colleague called in a favour and “volunteered” me to give a presentation to primary school children (year five) on the work I do as a scientist. I find it difficult enough to explain my job to taxi drivers, never mind children of a mere nine and ten years, and I had only ever given the idea of teaching school children about as much though as being a prison warder, or a lion tamer - so I was not a little apprehensive. What had initially been sold to me as perhaps a half-hour talk had grown into an entire afternoon of teaching to two different classes, and I have to say, I didn't really know what to expect.

**“Are you the scientist?”
I said that I was
...he punched the air and
shouted “YES!””**

The entrance to the school led me along a path, protected only by low railings, right through the middle of the playground during the lunch break – it looked and sounded like utter mayhem! At the end of the path was a gate that opened directly into the playground, with at least twenty metres of open ground to cover before the safety of reception. As I reached it, a most energetic and excited child appeared and enquired, “are you the scientist?” I said that I was, to which he punched the air and shouted “YES!” before skipping back off to play. This was probably a good sign, although it left me wondering if I had been billed as an act that I might not live up to.

After being escorted to the classroom by a fully-grown person, I was then left to set up my presentation watched over by the wide eyes, spontaneous inquisitiveness and complete lack of self-consciousness of a handful of the children who were setting up the room for the afternoon lessons. It was both refreshing and encouraging, and a taste of things to come. Throughout the afternoon, I was met with unbroken attention, excited and interested expressions and a constant flow of questions about being a scientist, about vacuum and plasma and nano-materials. To the child who wanted to know why we are all here and what made the Universe, I could only apologise for my ignorance, but the rest of the questions were right in my comfort zone. I had clearly got at least some of my message across, and it was apparent that the audience had a real thirst for it. Maybe one of those children will go on to be a scientist – perhaps even a physicist; with any luck, most of them will be inspired to learn at least enough to be able to make rational decisions as adults when faced with scientific issues.

Hopefully, they all now know a little about what “IPSI” scientists do – it will put them ahead of most people I meet outside my academic sphere!

We hear a lot in the media about grand projects, of space exploration and particle accelerators, but little of the work of the more “humble” scientists, whose discoveries in materials, etc. are often necessary to enable these projects to happen at all. I think it can only help our cause if more people of all ages appreciate our contributions to almost every aspect of modern technology, so if you have any IPSI – related outreach or public engagement activity that you think the group might be interested in, let us know and we will spread the word.

Glen West
(IPSI Chair)

Inspiring young scientists with Lego robots

I am currently in my final year studying for an engineering doctorate at the University of Surrey. In this role, I am being strongly encouraged to engage with the general public about science. My latest outreach activity was at St Peters CofE Primary School, Burnham where I worked along the Learning to Work team (Registered Charity: 1041403) to build and programme Lego robots. I was delighted to take part in this activity as I believe my own passion for electronics and computer science began when I had to build and program a Lego robot for a Sony Robot challenge to follow a black line around a track (aged 14).

The day began by the pupils (Years 5 and 6) in groups of 6 building the robots, in the afternoon they had to direct the robot around the maze using a graphical base programming package.

***“The pupils were very enthusiastic
...and a few tears were shed.”***

The pupils were very enthusiastic and at times they did struggle to communicate in their groups effectively and a few tears were shed. It was also interesting to see many pupils struggling with the building of Lego but found the concept of graphical program easy (how times are changing).

I overheard one little girl speaking to the boy in her group saying “you do all the building as you’re the boy”, I was shocked there was stereotyping at that age and spoke to the group to encourage every member to take it in turns building the Lego robot. I was able to use my past experience of being inspired by a similar

activity to encourage and relate to the children during a question and answer session about science and engineering jobs.

Hayley Brown
(IPSI Committee Member)



Hayley Brown, IPSI Group Committee

Forthcoming Meetings

Manufacturing Technologies Association Conference 17th February 2015, Cranfield University, Bedfordshire, UK

Following their successful seminar at MACH 2014, Cranfield University and the MTA have once again teamed up to bring Members a special conference on UK Industrial Surface Engineering. This free full day conference will be held on 17 February 2015 at Cranfield University, Bedfordshire.

Surface engineering has been recognized as an enabling technology which is capable of addressing some of the key issues faced by the manufacturing industry. The development, application and validation of surface engineering treatments are valuable tools in achieving differentiated products by allowing, at the same time, high materials performance and advanced designs.

This industrial conference day is chaired by Professor Jose L. Endrino, (Cranfield University) and it is intended for UK and international engineers and other professionals, from the supply-chain and end-users, as well as for members from academia currently dealing with advanced coating materials for any type of application. This major event, hosted at Cranfield University, aims to discuss some of the ideas to maintain an active innovation culture in this sector. Several keynote lectures during the morning and afternoon sessions will cover some of the present topics in UK Surface Engineering related to power generation, wear protection and tribology and highly functional applications. The event will close with an open discussion about the requirements for UK Surface Engineering industry in the future.

Follow this link to the conference website:

<http://www.mta.org.uk/whats-new/events/uk-surface-engineering-industry%E2%80%93present-future>

International Conference on Quantum, Atomic, Molecular & Plasma Physics (QuAMP 2015) 1st to 4th September 2015, University of Sussex, Brighton, UK

The International Conference on Quantum, Atomic, Molecular and Plasma Physics is the main UK conference devoted to these areas of physics. In 2015 it will be hosted by the University of Sussex in Brighton. QuAMP, which was founded in 2003 as a joint IOP/EPSC initiative, now alternates between a Summer School format and an International Conference. In 2015 it will be an International Conference.

The meeting will commence Tuesday 1st September 2015 with presentations starting at 2pm. It closes Friday 4th September at 4pm. In addition to the 12 invited talks there will be around 29 contributed talks chosen from the submitted abstracts. In addition, there will be the opportunity to present posters at the poster sessions.

For more information please visit: <http://www.sussex.ac.uk/amo/quamp2015/>

Abstract Deadline: Friday 3rd of July

Topics:

- Quantum technology
- Quantum information
- Metrology
- Ultra-cold matter
- Atomic and molecular interactions
- Ultra-fast phenomena
- Quantum optics
- Plasma physics

Local organising committee:

Prof B. Garraway (Chair), Dr. M. Keller (Programme chair), Dr. J. Dunningham, Dr. A. Pasquazi, Dr. M. Peccianti, Dr. D. Porras

Thirteenth COSIRES 2016

19th to 25th June 2016, Loughborough University, Loughborough, Leicestershire, UK

The 2016 Computer Simulation of Radiation Effects in Solids (COSIRES) is the 13th edition of this conference. The biennial conference is a major international forum to present and discuss the recent achievements in the advanced computer modelling of surface and bulk phenomena stimulated by all forms of irradiation. Fundamental understanding of these phenomena is often not accessible by experiments, since they occur on very small time and length scales.

A vigorous development of both computer hardware and theoretical methodologies which has occurred in recent years has pushed the field into the forefront of a modern science.

Follow this link to the conference website: <http://www.cosires2016.co.uk>

For a full listing of events organised by the IPSI Group Committee please visit: <http://www.iop.org/activity/groups/subject/ipsi/calendar/index.html>

IPSI Student Funding

The Institute of Physics provides financial support to research students to attend international meetings and major national meetings.* The Institute of Physics (IOP) handles the application process but it is the relevant IOP group that makes the decision on whether to award the bursary and its value.

Am I eligible?

Research Student Conference Fund (RSCF) bursaries are available to PhD students who are a member of the Institute and of an appropriate Institute group. For example, if an applicant is a member of the Women in Physics Group only then they could only seek support to attend a conference related to women in physics and not to low temperature physics. To be eligible for that meeting, the applicant would also need to be a member of the Low Temperature Group.

What is the bursary worth?

Students may apply for up to £300 during the course of their PhD. Students 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. Groups have limited funds to award bursaries and so students may not receive the full amount they have requested. If the full amount is not awarded students may apply again to receive further support for a different conference until they reach £300 overall. 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.

How can I apply?

Application details and application form:

http://www.iop.org/about/grants/research_student/file_38809.doc

RSCF applications are considered on a quarterly basis and should reach the Institute by: 1 March, 1 June, 1 September or 1 December; a decision will be made within eight weeks of the closing date. Your application must reach us by the deadline which is at least three months before the conference you wish to attend. We strongly recommend that you submit your application early.

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

For further information please contact: supportandgrants@iop.org

* Please note that bursaries are not available for meetings organised by the Institute of Physics including those organised by IOP Groups.

The Committee

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The IPSI Group welcomes ideas from members for topics for future events, including conferences, meetings and workshops. Please contact the Chairman or Secretary. This newsletter is also available on the web and in larger print sizes. The contents of this newsletter do not necessarily represent the views or policies of the Institute of Physics, except where explicitly stated. The Institute of Physics, 76 Portland Place, W1B 1NT, UK. Tel: 020 7470 4800 Fax: 020 7470 4848