
IOP | Institute of Physics
Vacuum Group

NEWSLETTER

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Courtesy MKS

Looking Back - See page 14

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The Vacuum Group

The Vacuum Group endeavours to appeal to as many people as possible in academe, industry and research by arranging meetings covering the widest possible range of subjects for which vacuum is important.

The composition of the Group Committee reflects the broad coverage of the subject aimed at by the Group, encompassing academics, representatives of vacuum manufacturers and vacuum users in government and industrial laboratories. The Group has been successful in bringing together those engaged in the production and improvement of vacuum equipment with those concerned with its application in such diverse areas as medical physics, large machines for research in the physical sciences, industrial process control and the electronics and semiconductor industries.

The Vacuum Group takes an active interest in education for those working with vacuum technology. The Group maintains close links with the British Vacuum Council ([BVC](#)), the International Union for Vacuum Science Technique and Applications ([IUVSTA](#)) and Vacuum Symposium UK.

The Group aims to organise a programme of half-day and full-day meetings, some of which have taken the form of workshops or included mini-exhibitions. The group actively participates in the Vacuum Symposium UK series of conferences.

Report of the Chair, 2017-2018

After a period when the Group activity has largely been confined to participating in events organised by others, it is pleasing to note that in the past year our programme of activities has been renewed – details are elsewhere in this letter. We aim to carry on with this during the coming years.

The Vacuum Group has run occasional short training courses related to vacuum based science and applications for many years and has been involved in the series of short vacuum courses during the UK Vacuum Symposiums from the start. Although the format these is good for learning the basics of a new field or a specific method, technique or type of instruments, it is too short for in-depth and systematic education. This year there has been the first in, hopefully, an ongoing series of longer, more in-depth courses. We are grateful to Dr Oleg Malyshev for taking this initiative forward.

Members have continued to engage in various other bodies and meetings and the reports in this newsletter will give you a flavour of what they are doing in the world of vacuum.

I do want to thank the Committee members for the work they do, fitting this in with their busy professional lives as a purely voluntary activity

Ron Reid

Group Meetings

2018 Training Course on Vacuum System Design and Maintenance

Vacuum technology is an enabling tool for many industries and an important media for various research and applications.

A 3-day medium level course on Vacuum System Design and Maintenance was organised by IoP Vacuum Group and held in Mercure Chester Abbots Well in Chester on 12-14 June 2018. The course aim was to provide a grounding in practical vacuum usage for people who use and have some experience in vacuum. The trainees were expected to have some basic knowledge in vacuum technology and instrumentation and, preferably, experienced in using vacuum equipment. Thus, the course was designed as a next step for those who have attended an introductory level course in this field (e.g. one or more of the training courses at the Vacuum Symposiums series), and were already familiar with pressure units, pressure measurements and vacuum pumps.

Experienced vacuum personnel gave six lectures and covered the topics listed below:

- An introduction into vacuum system design (Dr Oleg Malyshev, ASTeC, STFC Daresbury Laboratory)
- Materials for vacuum, connections, joints and sealing (Dr Richard Pilkington, The University of Salford)
- Vacuum gauges and RGAs (Dr Ron Reid)
- Vacuum pump and valve operation and maintenance (Dr Sunil Patel, ISIS, STFC Rutherford Appleton Laboratory)
- Cleaning, cleanliness and surface treatments (Dr Keith Middleman, ASTeC, STFC Daresbury Laboratory)
- Leak detection and how to fix vacuum leaks (Dr Graham Rogers, Leybold Vacuum)


The lectures not only covered text-book information but also involved sharing personal experiences to highlight how various technical challenges were overcome. The twelve trainees attended the lectures, and interacted with the lecturers at coffee breaks, lunches and dinners, sharing experience with each other.

The course concluded with a practice project on vacuum system design led by Dr Andrew Chew (Atlas Copco High Vacuum Division) where each group of trainees selected a different problem to solve by designing a vacuum facility, making a basic layout, discussing main vacuum challenges and solutions, then reported it to the class. The lecturers provided advice and comment when necessary.

The feedback from the trainees has shown that the course was beneficial for both graduates and vacuum technicians looking to develop their knowledge and technical skills. The course will be repeated in 2019 and advertised during VS10.



Course participants near the Mercure Chester Abbots Well hotel in Chester.

Course sponsored by  Agilent

Oleg B. Malyshev

Status and Future Developments in Solar Thermal Vacuum Systems Engineering

Half-Day Conference: 21st March 2018 London South Bank University

Sponsored by the IOP Vacuum Group and Centre for Advanced Materials Research, LSBU.



Some 20 delegates attended this conference, which was opened by the Chair, Dr Andrew Chew, who shared his expertise on vacuum systems as a Global Applications Manager of the High Vacuum Division, Atlas Copco. Dr Chew has over 25 years of experience as a practitioner and is a committee member of the IOP Vacuum Group.

The first speaker was Prof. Philip Eames, Director of the Centre for Renewable Energy Systems Technology and Professor of Renewable Energy at Loughborough University, with high-quality contributions in over 170 journals. His work has widely been recognised all over the world and cited as one of the principal founders and contributions in Solar Thermal and Vacuum Systems. Prof. Eames gave a talk on the scope and future developments in the evacuated enclosures for high performance flat plate solar thermal collectors.

Dr Trevor Hyde travelled from Northern Ireland to London South Bank University to share his research work on the scope of Advanced Vacuum Insulated Glazing in the built environment. Dr Hyde is a Reader at Centre for Sustainable Technologies at Ulster University. He has several decades of research contributions in the vacuum science in glazings and the built environment. His research focuses on advanced vacuum glazing and façade systems, building integrated solar thermal systems and evaluation of high-performance insulation systems.

Dr Yueping Fang gave a talk on simulation and experimental validation of vacuum related advanced glazing systems. Dr Fang is a Senior Lecturer in Building Services Engineering at Coventry University. His research focuses on thermal evaluation of advanced vacuum glazing and vacuum insulation systems and technologies through experimental characterisation and theoretical evaluation.

Dr Harjit Singh's topic was on advanced thermal insulation for opaque surfaces: vacuum insulation panels. Dr Singh is a Senior Lecturer in Built Environment Engineering and Energy at Brunel University London. His research focuses on various aspects of solar energy use in the built environment such as vacuum insulation panels, Solar Collectors and energy efficiency in buildings.

The conference was mainly funded by the Institute of Physics Vacuum Group and supported by Centre for Advanced Materials Research, School of Engineering, London South Bank University.

Special thanks are due to the School of Engineering Dean Prof Asa Barber and the Head of Division of Electrical and Electronic Engineering Dr Osman Tokhi and Prof. Graeme Maidment.

Saim Memon

The 2017 IOP Sponsored Poster Prize



The winner of the 2017 IOP Sponsored Poster Prize which was awarded at Vacuum Symposium on the 10th October, 2017, was Abdul Hadi Gaddah (pictured left) from Manchester Metropolitan University Surface Engineering Group.

The judges were impressed with both the scientific content and effectiveness of communication of his poster, which was about “Environmental applications of coated fly ash”.

Abstract: Fly ash is a residue of coal combustion in thermal energy generation. The fly ash particles are hollow, spherical in shape and vary in size ranging between 0.5 to 300 μ m. Fly ash consists of a number of elements including: silicon, aluminium and iron. Fly ash is becoming subject to a growth of research on how to utilise it as a waste by-product. Even so, fly ash has still not been explored to its full potential. This research aims to determine the parameters for the most efficient and the best quality coating of different metals and compounds on fly ash using magnetron sputtering; utilising the coated fly ash for environmental purposes, such as in different aspects of water treatment.

Titanium dioxide coated fly ash was prepared using reactive unbalanced magnetron sputtering. The fine powder, fly ash, is placed in an oscillating substrate holder adapted from a bowl feeder system, allowing the particles to tumble around the bowl and not just bounce vertically. The substrate holder is located between the two planar titanium targets. Each target is controlled independently by a dual channel ‘Advanced Energy Pinnacle Plus’ power supply. The coated product is analysed using Raman spectroscopy and X-ray fluorescence to confirm the deposition of titania on to the fly ash. Photocatalytic activity was tested by acetone degradation and methylene blue dye degradation tests. The results confirm the successful deposition of titanium dioxide on to the fly ash. This means the method applied is a viable method for coating powders and the final product ‘coated fly ash’ may be incorporated into water treatment systems.

2018 Poster Prize

The 2018 Poster Prize will be awarded on 10th October at Vacuum Symposium, for more details go to <http://www.vacuum-uk.org/2018-event/poster-session/> – posters on all aspects of vacuum science, technology and its applications are welcomed.

Vacuum Symposium UK



Vacuum Symposium UK was formed to embrace all of the UK vacuum community. Its aim is to bring together academics, industrialists, engineers, manufacturers and anyone using vacuum to promote UK pre-eminence in the subject.

Vacuum is a key enabling technology for a wide variety of applications that are of growing importance in the 21st Century. Whilst there is an abundance of information on the Internet and elsewhere we believe that the annual event organised by Vacuum Symposium UK provides a unique opportunity for networking and education, in addition to topical meetings of interest to vacuum users.

The meetings within Vacuum Symposium UK are free to attend. We welcome anyone with experience and contacts to organise a vacuum related meeting that will attract and interest the diverse spectrum of vacuum users. See our website www.vacuum-uk.org for more details.

The Vacuum Symposium event is co-located with Vacuum Expo – the UK's premier exhibition of vacuum equipment – all on one site, under one roof. Attendees are welcome on one or both days of the

Vacuum Symposium UK is an independent organisation (Registered Charity No. 1137989). Our roots were based in the RGA User Group but nowadays we seek to encompass all aspects of vacuum with a view to establishing a UK annual event worthy of hosting an International vacuum conference.

Steve Shannon, SS Scientific Limited

The Harry Leck Memorial Medal

Each year the organising committee of Vacuum Symposium UK seeks nominations for the Harry Leck Memorial Medal. The Medal is awarded for distinguished contributions to British scientific research and/or related scientific/technical communities, in the field of Vacuum Science and Technology.



The medal has been established to honour the memory of **Professor John Henry Leck**, known to his friends as 'Harry'. Harry was a former Chair of the IoP Vacuum Group.

Previous winners are Dr Austin Chambers, Dr Ron Reid and Prof John Colligon. Further details and nomination forms are available at <http://www.vacuum-uk.org>

uk.org/about/harry-leck-memorial-medal/

The British Vacuum Council



The Institute of Physics is a member of the British Vacuum Council and nominates members of the Council.

The web site contains the BVC mission statement, remit, activities, events, members, the current committee, and a whole lot more! There is a leaflet to download, explaining the purpose of the BVC, that can be folded into a third the size of A4 and can be used at conferences and meetings for delegates to read. Additionally, there is a PowerPoint™ presentation of 'What the BVC is and what it does'. This can be further used as an educational tool to give a brief introduction to the history and 'workings' of the BVC.

The BVC offers two prizes annually; The British Vacuum Council Senior Prize (with associated John Yarwood Memorial Medal) and the British Vacuum Council Junior prize (which comprises the BVC Medal and C.R. Burch Award). Within the web-site there are lists of former recipients and details of how to nominate a candidate for a current prize. Nomination is always open which means that, if the deadline is missed one year, the nomination can be submitted the following year for consideration by the Committee. See it all here <http://www.british-vacuum-council.org.uk/>

Please consider making a nomination.

The BVC is your link to IUVSTA (The International Union for Vacuum Science, Technique and Applications), and the web-site is an ideal way to trace this link. The site can directly link you electronically to the IUVSTA web site. The IUVSTA Divisional Representatives can be found, who are your link to IUVSTA activities within your field, via the web-site <http://iuvsta.org/>

BVC will again have a stand at the VacExpo at the Ricoh Stadium, 10th-11th October 2018.

Alan Webb

British Vacuum Council Prize

The BVC Senior Prize for 2018 and John Yarwood Medal will be awarded to Dr Bill Allison of the University of Cambridge at a special symposium which will recognise his contributions to understanding the structure and dynamics of surfaces using Helium Atom Scattering techniques. The symposium titled Nanoscale Surface Structure and Dynamics will take place on Thursday 11th October 2018 in Lounge South, Ricoh Arena, Coventry, CV6 6GE. Details at <https://www.vacuum-uk.org/2018-event/nanoscale-surface-structure-dynamics/>



Nominations for the prizes can be made at any time through the BVC website www.british-vacuum-council.org.uk

The European Vacuum Conference – The First 30 Years

The 15th European Vacuum Conference took place in Geneva from 17-22 June 2018 and began with celebrations of two anniversaries: first to mark 60 years since the founding of the International Society, now called the “International Union for Vacuum Science, Technique and Applications” (IUVSTA) and, second, to mark 30 years since the first European Vacuum Conference (EVC1) was held in Salford UK from 11-15 April 1988.

John Colligon proposed the idea of this new series during the 51st meeting of the IUVSTA Executive Council held in Debrecen, Hungary. The proposal was approved by the IUVSTA Executive Council and John Colligon was invited to set up and chair the first event. This, EVC-1, took place in Salford UK from 11- 15 April 1988 and was well supported. The 57th IUVSTA Executive Council meeting took place just after the conference in nearby Hale. Procedures for bidding and running future conferences were then established for this series with the Vacuum Science Division of IUVSTA responsible for seeking bids for future EVC’s and John Colligon (who then became Secretary General of IUVSTA from 1989-1998) providing the IUVSTA link as EVC series chair. The EVC series is now part of the established portfolio of IUVSTA meetings

The Institute of Physics in London provided excellent support for the organisation and running of EVC1 and the Vacuum Group and members of other IOP Groups worked hard to prepare and organise the scientific programme and advertise the event. Austin Chambers arranged an excellent manufacturers’ exhibition.



John Coburn talking with Ian Owen and John Colligon at the EVC1 exhibition.

The EVC-15 celebration events started on the Sunday Evening with a reception for invited guests who had been associated with IUVSTA during its 60 years. The conference itself began on the Monday morning with a welcome and introduction by the conference chair Dr Martin Wüest followed by a short overview of the 30 years of EVC by John Colligon. This opening session “was followed by an Invited plenary talk by Professor Ludvik Martinu on “Optical coatings of tomorrow: From passive interference filters and multifunctional systems towards smart meta-structures - Change of paradigm?” Here Professor Martinu showed that latest work studied improvements in optical, tribological and mechanical properties. High Impulse Magnetron Sputtering is seen to cause a reduction in retained stress in the coatings. Silver-based coatings on windows control heat flux passing through and VO₂ coatings reduce reflectivity.

In the sessions that followed, one was devoted to Vacuum Science and Technology and the other to Nanostructures and Nano-Technology; the former including papers concerning a new UHV/XHV pressure standard, a paper on an optical diaphragm gauge measuring from 30 to 1000 Torr and a paper on the new SI unit of pressure (this one correctly not using Torr!)

On Monday afternoon a special session marking the 60 years of IUVSTA was held. Joe Greene gave a fascinating talk covering a much longer period marking the key points in the evolution and use of materials from the “Big Bang” era. One point of interest was the evidence of liquid beer in the city URUK 5000 years ago formed by mixing wheat in a liquid and probably using a vacuum process. Another later development, in terms of coatings, was to rub carbon onto copper and bronze substrates before adding hot gold which provided better adhesion of the gold.

Other plenary lectures were

Christian Teichert, Montanuniversität Leoben (AT)

“The fascinating world of organic nanocrystals on 2D materials”

Crystalline films of small conjugated molecules offer attractive potential for fabricating organic solar cells organic light emitting diodes (LEDs), and organic field effect transistors (OFETs) on flexible substrates. Here, the novel two-dimensional (2D) van der Waals materials like conducting graphene (Gr), insulating ultrathin hexagonal boron nitride (hBN) or semiconducting transition metal dichalcogenides come into play. Gr for instance offers potential application as transparent conductive electrode in organic solar cells and LEDs replacing indium tin oxide, whereas hBN can be used as ultra-thin flexible dielectric in OFETs. Since small conjugated molecules, like the rod-like molecule para-hexaphenyl (6P), fit well to the hexagonal structure of 2D materials, growth of 6P can be expected in a lying configuration. This has indeed been observed by low energy electron microscopy for growth of 6P on Pt(111) supported Gr in a layer by-layer fashion.

Self-assembly of crystalline needles composed of rod-like molecules on

exfoliated, wrinkle-free Gr and hBN, both transferred onto SiO₂ are reported. The needles are several 10 nm wide and a few nm high, they can extend to several tens of micrometers in length. The discrete needle directions with respect to armchair and zigzag directions of the substrates were determined by atomic-force microscopy (AFM) in conjunction with density functional theory calculations.

Through in-situ measurements during molecule deposition on Ge in field-effect transistor device geometries, the charge transfer at the interface was directly probed. The amount of charge transferred per adsorbed molecule is only about one thousandth of an electron transferred per molecule. Further, electrostatic force microscopy (EFM) based charging and charge-spreading experiments demonstrate the optoelectronic properties of the organic nano-needles. Finally, AFM based manipulation is employed to probe the mechanical robustness of the 2D materials as well as of the organic nanocrystals.

This study has been performed in collaboration with G. Hlawacek, M. Kratzer, A. Matković, J. Genser, G. Lin, A. Cizek, A. Vukusić (Leoben), R. van Gastel, F.S. Khokhar, B. Poelsema (University of Twente, Netherlands), J. Vujin, B. Vasić, Stanković, R. Gajić (University of Belgrade, Serbia), Z. Chen, O. Siri, T. Léoni, C. Becker (Aix Marseille Université, France), D. Lüftner, and P. Puschnig (University of Graz, Austria).

Professor Maria Ascensio, Soleil Synchrotron (FR)

“Chemical and electronic imaging of energy and electronics materials important for basic science and industrial applications”

Prof Ascensio discussed the use of photo-emission for 1 D analysis with 1nm resolution. In addition, Carbon peaks can be seen to vary depending on the environment of a carbon atom. Prof Ascensio also mentioned that at Soleil they have angle-resolved photo emission spectroscopy which can determine the band structure of a material.

Kai Nordlund, University of Helsinki (FI)

“Fundamental mechanisms of accelerated and plasma ion interactions with materials: insights from atomistic simulations”

Simulation models indicate that H ions bombarding Carbon at medium energy cause bonds to break whereas, at low energy the H simply reflects. Models also show that some metals such as Beryllium, Tungsten, Carbon and Iron can sputter via a chemical process in which the sputtered atoms have much lower energy than for non-chemical sputtering. Heat spikes can lead to direct production of large damage clusters and sputtering of atom clusters. Most recently, joint experimental and theoretical efforts have shown that in nanoclusters and nanowires, heat spikes can lead to huge sputtering yields exceeding 1000 atoms and major modification of the entire structure. For ion channelling, results show that for typical ion implantation conditions, a large

fraction (20-60%) of all crystal directions are channelling ions. Due to this, even when irradiating polycrystalline materials, one cannot *a priori* assume channelling effects are negligible.

Philippe Walter, University Paris 6 (FR)

“Nanostructures and layer stacking in artistic materials: the origin of colors in paintings

Dr Walter explained that present-day materials science provides us with a vision of the processes involved in the creation of a work of art, from the choice of materials to the visual perception of the finished work.

The precious character of the paintings of the Old Masters and their uniqueness imply particular caution in analysis and require instruments, which may give the maximum of information directly on the surface of the objects, in-situ, in the museums or archaeological sites.

The implementation of new analytical tools, including various spectroscopies, now allows a deep insight into the artistic materials. Dr Walter described applications of different mobile instruments built recently in the laboratory which showcase how Cadmium Sulfide pigments may assume different hues from yellow to orange, depending on their conditions of formation.

During the 19th century, various synthetic routes for CdS nanoparticles synthesis were explored to produce pigments for artists, precipitating cadmium salts with sulfur precursors. Several factors are involved in the colorimetric values of the CdS such as structural defects, polymorphism in the crystal lattice and nanometric size of the crystallites. This complexity postponed the supply of these pigments to the artists for more than 20 years after the discovery of cadmium in 1817. The light-stability of these pigments is also related to the nanometric crystallite size and the degree of crystallinity that can be improved by thermal treatment.

EVC15 Selected contributions

Measurement of the radiation tolerance of vacuum pumps

Author(s): Andrew Chew, Peter Lambertz, Paul Smith, Leybold;

Vacuum pumps and other components can be exposed to varying types and quantities of radiation. These include applications/apparatus in medical diagnostics and treatment, analytical instrumentation, sterilization techniques, space simulation as well as the established requirements in High Energy Physics.

This paper presented recent radiation tolerance measurements made by a DLA/ISO registered radiation test house for several scroll and other dry primary and turbomolecular secondary pumps and a range of ‘active’ and ‘passive’ gauges. Comparisons with other historic ‘in-situ’ measurements and an assessment of the irradiated components was discussed and a program for the

development of application specific radiation-compatible products proposed.

Elsevier Tutorial session on “How to get Published”

Oleg Malyshev, STFC Daresbury Laboratory, UK

This lunch-time seminar was well supported by about 40 delegates. Dr Malyshev explained the processes and checks required to submit a paper which is more likely to be accepted. The main starting point is to go to the journal home page and note all instructions for style, headings, diagrams and references. Make a further check on these just before submitting the paper. If revision is required, then make sure all the comments of reviewers are addressed and your response to them written in a letter which goes to reviewers. Remember these reviewers are experienced in your field and freely give their time to help you produce a good paper.

John Colligon

Looking Back

Through the 1970s into the 80s there was a big effort to try and find a way to fabricate cheap, efficient solar cells. The term ‘Photovoltaics’ was hardly used, as various forms of thin film silicon layers were deposited by various techniques.

One of the favoured methods, mainly because of its simplicity, was ‘cracking’ or fragmenting silane (SiH_4) in a plasma or gaseous discharge. This produced amorphous or microcrystalline silicon films, with varying amounts of hydrogen incorporated within the films.

There were methods of depositing the films without using SiH_4 , chemical transport being one of them. Such methods were deemed to have better control on the composition of the resultant films.

The type of films and composition determined to a large extent, how it behaved when fabricated into a device. Thus the need to find the optimum gaseous species within the plasma and to control the amount of hydrogen incorporated became a source of speculation and hence research projects.

Representative sampling of the plasma is of prime importance if the gas phase species are to be identified. However, conclusions drawn from mass spectrometric analysis of effluent gases must be reached with utmost caution, as recombination, deposition and desorption are just some of the likely process that can occur between the glow discharge and the sampling position.

The equipment designed for this particular issue centred around minimizing the path length between the plasma and the analyzer of the Mass Spectrometer. Using a high-resolution mass spectrometer led the equipment design to a three stage differentially pumped system.

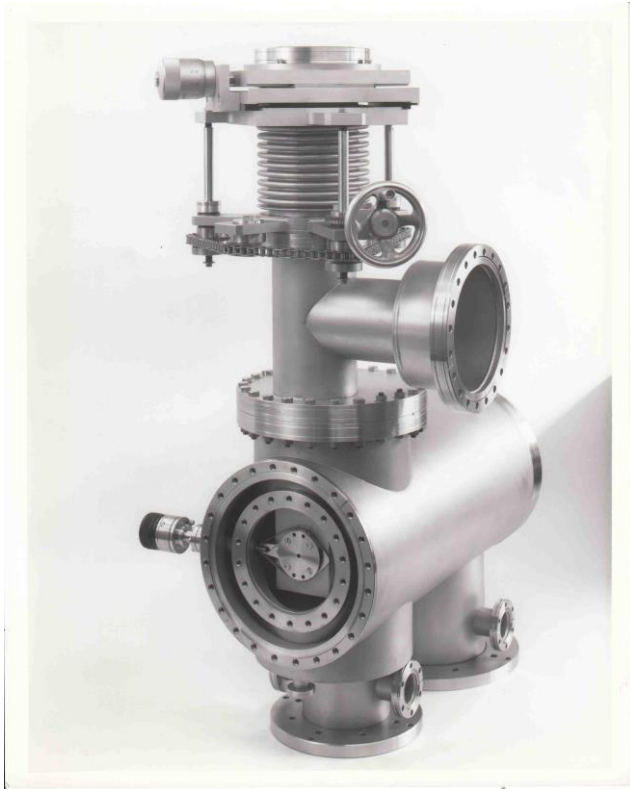


Figure 1 The vacuum chamber, as manufactured by Leisk Engineering

straight forward, but other applications have been found for this type of instrumentation.

It was quickly realised that this 'add-on' could lead to various forms of process control for many types of plasma processes. It was developed for both in-situ control as well as end point detection in plasma etching systems, for example.

So, if the process that was running was monitored, such that the optimum conditions observed, the process could be adjudged to have been successful without further destructive or measurement assessment. Etching through different layers would provide different mass (isotope) signals thus determining in-situ how far the etch had proceeded, thus providing an end

The photo (Figure 1), shows the vacuum chamber and the second photo (figure 2) the vacuum system with the pumps, diffstack and turbomolecular pumps fitted.

The paper (1) resulting from the research gives a full account of the rationale, details on the design, resultant spectra and some concluding remarks.

Further results were published in the conference series ICPIG (1987) (2)

From this work, and many more different examples, trying to identify the important species rather than the predominant ones, led mass spectrometer manufacturers to start to develop 'in-situ' QMS systems that could be 'add-ons' to plasma systems. As already stated quantitative analysis is not

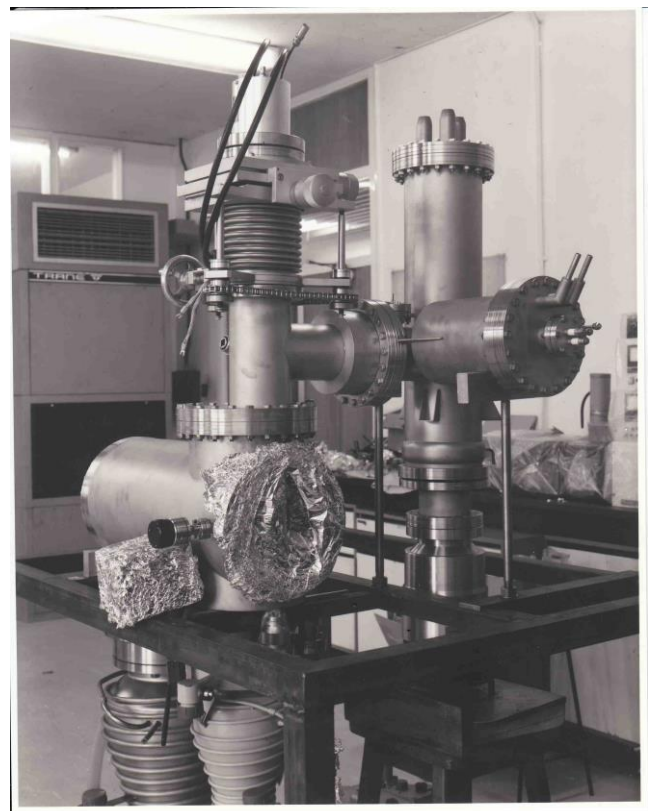
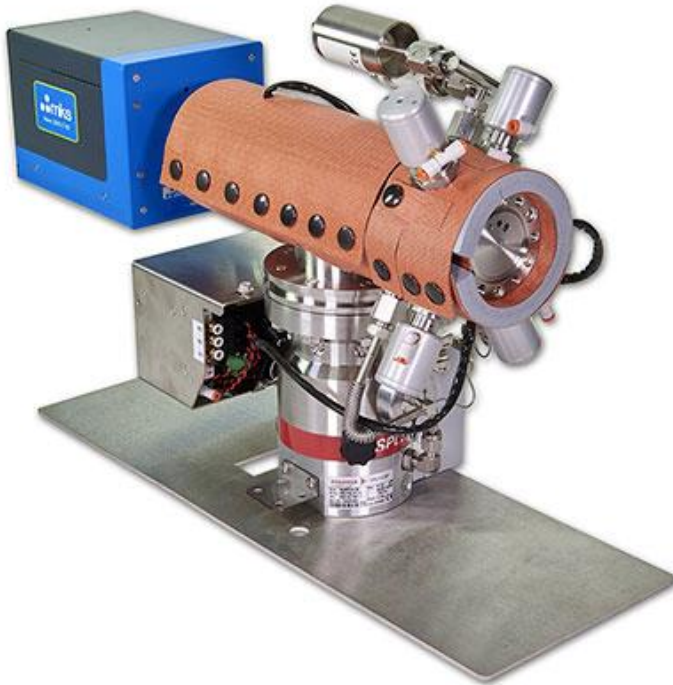


Figure 2 The vacuum system ready to be connected to the plasma system



and A.P. Webb

18th Int. Conf. on Phenomena in Ionised Gases Swansea; 1 (1988) 184-187

For any further details of the original sampling system contact Dr N P Johnson at Glasgow University Nigel.Johnson@glasgow.ac.uk

Alan Webb

Figure 3 3 A commercially available differential pumped plasma sampling system. (by courtesy of MKS)

point to the process.

It was thought a great success in the manufacturing environment that a process could be monitored in such a way without further assessment.

References

(1) A Mass Spectroscopic System for the Study of Transient Plasma Species in Thin Film Deposition

N.P. Johnson, A. P. Webb and D. J . Fabian

Mat. Res. Symp. Proc. Vol 10 (1984) 271 – 282

(2) Mass Spectrometric Study of Chemical Relaxation and Kinetics in a

Silane RF Plasma

N.P. Johnson, D.J. Fabian, A. Szasz, Z. Szaszne-Csih

Forthcoming events

Vacuum in Food Manufacturing

Wednesday 10th October 2018 (AM) | Media Centre, Ricoh Arena, Coventry, CV6 6GE

Introduction

The food and drink manufacturing industry contributes £28.8bn to UK gross value added annually (DEFRA) and vacuum technologies are applied across many aspects of this substantial industry. This meeting will bring together a range of applications of vacuum in food manufacturing, for example vacuum cooling and drying, deodorization, aseptic processing and sterilization, storage and transport. It will provide a forum to link delegates from the food manufacturing sector with vacuum equipment developers and suppliers, platforming industrial and academic presentations on developments and the 'state of the art' in the various applications of vacuum in food manufacturing.

The programme is co-sponsored by the IoP Vacuum Group and the IoP Physics

in Food Manufacturing Group. A half-day meeting is being organised leaving plenty of time for networking and a visit to the Vacuum Expo exhibition of vacuum equipment and suppliers.

VS10, 2019

The 60th anniversary of the journal Vacuum will occur in 2019. A symposium on 'Vacuum Applications over the Years' will be proposed to the organisers of VS10.

Book Review

'Vacuum Science & Technology'



Bert Suurmeijer, Theo Mulder and Jan Verhoeven
The High Tech Institute and Settels Savenije Van
Amelsvoort, Eindhoven

ISBN: 978-90-9029137-6

712pp

Writing any text book is an enormous effort and undertaking but one on the subject of Vacuum Science and Technology has unique challenges.

These include the enormous breadth of the world of vacuum; its dynamic range and associated principles within this, a continually evolving range of applications and their impact on the requirements for future generations of vacuum equipment and systems.

Suurmeijer, Mulder and Verhoeven have produced a text accessible to all; from those with high school diploma to those in academia. This is complemented by clear first principles derivations starting from the very first sections on kinetic theory and adsorption mechanisms.

Pump mechanisms and their operational principles are comprehensively reviewed again with clear mathematical treatment. The chapters on pressure measurement are probably the most clear and detailed I have seen published. Similarly the leak-detection chapter comprehensively covers theory and practical methods. The level of treatment given to sealing techniques and other components is highly appropriate. The general observations, calculated examples and exercises are well constructed and very relevant.

The authors have provided us with an extremely important contemporary book on the subject of vacuum which will be an invaluable addition to the resources of

students, educators, theorists and practitioners alike. Whatever the level of complexity they operate at, all those involved with vacuum will benefit from having this book on their shelves.

Andrew Chew

Committee 2018

Chair Dr Ronald Reid CEng CPhys FInstP

Secretary Mr Robert Livesey CPhys FInstP

Treasurer Dr Gianfranco Claudio CPhys MInstP, University of Loughborough

Ordinary Members

Dr Alan Webb, CPhys FInstP

Dr Hazel Assender CPhys MInstP, University of Oxford

Dr Oleg Malyshev, MInstP, STFC Daresbury Laboratory

Dr Yueping Fang, MInstP. University of Ulster

Dr Andrew Chew, MInstP, Edwards Ltd

Dr Saim Memon MInstP, London South Bank University

Coopted Members

Mr Robin Hathaway, SS Scientific Ltd

Dr Gordon Jones, MInstP, Waters Corporation

Join the Vacuum Group

The Group welcomes new members.

If you are already a member of the IoP, then go to your MyIOP page and simply sign up. **It will not cost you anything extra!** Alternatively follow the instructions on http://www.iop.org/activity/groups/page_38363.html

If you are not yet a member of the IoP then go to <http://www.iop.org/membership/index.html> and follow the links there to get full information.

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.

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