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Co-opted Committee Members		
Local chairperson for "Applications of Carbon Science in Medicine" meeting	Prof. Sergey Mikhalovsky, CChem, FRSC Professor of Materials Chemistry School of Pharmacy and Biomolecular Sciences University of Brighton Cockcroft Building, Lewes Road Brighton BN2 4GJ Tel +44 (0)1273 642034 Fax +44 (0)1273 679333 s.mikhalovsky@bton.ac.uk Affiliation – RSC	
Appointed Representatives for 2014		
SCI	Dr Geoff Fowler,	
RSC	Dr. N. Parkyns	
ЮР	Dr Peter C. Minshall	

Editorial

This is a slightly bigger issue of the newsletter than I had expected. The first thing I have to do is to draw your attention to our Christmas meeting at Manchester on December 18th. This year because we have already had our AGM, it will have a slightly different format with more time available. It will focus, appropriately enough given the venue, on graphene research and is described rather light-heartedly as a graphene bash. We have already had a lot of interest from preliminary notices sent out, so put this date in your diary. Also, have a look at the meeting notice to see if you would like to enter the competition on graphenograhy for which we are offering a prize. Full details are of course in this newsletter.

The possible crisis in energy supply, the so-called energy gap, has meant that our existing nuclear plants are having their lives extended as long as possible. This does make the next EdF/ BCG meeting on nuclear energy all the more pertinent. It will be held in Nottingham in May and again, all details can be found here.

I would also draw your attention to two Faraday Discussions on Carbon that take place next year. The first is the meeting on Carbon in Electrochemistry at Sheffield in July. The second is on New Advances in Carbon Nanomaterials and will be held at the RSC at Burlington House. We are sponsoring this Discussion, so all BCG members will be able to register at the discounted rate. I include announcements for other meetings that are relevant to carbon research. All in all, we have a very busy 12 months for meetings on carbon within the UK as well as elsewhere.

We had a very successful meeting on "Sustainable Carbon Management" at Imperial College on November 6th that included the 6th Ubbelohde lecture, delivered by Prof. Rodriguez-Reinoso. It was followed by presentations by Geoff Fowler from IC, Mark Downs (Jacobi Carbons) and Paul Fennell (IC). It included our 2013 AGM at which we said goodbye to some of the committee members, one hopes only for the time being, and elected Nassia Tzelepi to serve on it. We have a brief outline of Nassia's work to introduce her to you. I am including the minutes here that Peter Minshall very kindly and promptly sent. It seems relevant to include them in this issue as our Chairman's report does refer to events covered in this newsletter. The members of the 2014 committee appear above.

I am also including the report on ECCRIA 5 that, despite being advertised on the cover, did not appear in the last newsletter, because of an oversight on your Editor's part, for which he apologises.

Norman Parkyns norman.parkyns@tesco.net

18 December 2013 12.30pm

Venue Staff House, University of Manchester

Registration email: peter.c.minshall@ magnoxsites.com

RITISH CARBON GROUP Xmas Graphene Bash

The British Carbon Group (registered charity 207890) is affiliated to The Royal Society of Chemistry, The Institute of Physics and The Society of Chemical Industry

The British Carbon Group



A half day meeting will be held on Wednesday 18th December at the University of Manchester (Staff House) devoted to UK graphene research.

There is no fee for the meeting; however, in order to estimate catering requirements please register your intention to attend as soon as possible with Dr Peter Minshall, but at the very latest **by Thursday 12th December**.

12.30 Buffet lunch (free)

13.30 Welcome – Prof. Malcolm Heggie, University of Surrey & Chairman of BCG

13.35 Keynote lecture: Dr Irina Grigorieva, The Graphene Centre. Engineering graphene properties: defects, membranes and heterostructures

- 14.30 Dr Rob Dryfe, University of Manchester: Graphene Electrochemistry
- 15.00 Tea and coffee.
- 15.30 Dr Neil Wilson, Warwick University: *Evolution of structure and properties upon functionalisation: when is graphene no longer graphene-like?*
- 16.00 Dr David Carey, Surrey University: Band engineering of graphene and related materials
- 16.30 Dr Jonathan Hinks, Huddersfield University: *Microstructural evolution* of graphene under displacing radiation
- 17.00 Award of "Graphenography" prize and close.

Graphenography Competition

A prize of £100 is offered for the best artistic interpretation of graphene science through art, sculpture, photography, microscopy or digital creation. The entries will be judged by the British Carbon Group committee and their decision will be final and binding. Please note that submission grants the British Carbon Group licence for use in its publicity material. Please send your entries by post or email to Dr Peter Minshall, Secretary of the British Carbon Group, by 5pm on Friday 13th December.

Dr Peter C. Minshall, Hunterston Room, Magnox Ltd Oldbury Technical Centre, Oldbury Naite, South Gloucestershire BS35 1RQ Tel: +44 (0) 1454 422287 peter.c.minshall@magnoxsites.com



IOP Institute of Physics





CALL FOR PAPERS

4th EdF Nuclear Graphite Conference

The National College, Triumph Road, Nottingham NG8 1DH

Tuesday 6th – Friday 9th May, 2014

"ENGINEERING CHALLENGES ASSOCIATED WITH THE LIFE OF GRAPHITE CORES"

Conference Chairman: Prof Peter Flewitt

The fourth EdF Energy Generation Ltd Nuclear Graphite Conference will take place in Nottingham in May 2014. The venue is a fully residential conference centre, The National College for Teaching and Leadership, which enjoys a lakeside setting at the southern end of the Jubilee Campus of The University of Nottingham.

The focus of this fourth conference is on larger structures (*e.g.* reactor cores or large experimental graphite rigs), and abstracts are now invited under the following general topic areas:

- Inspection and Monitoring
- Assessment
- Engineering Models

Abstracts (max 200 words) may now be submitted, in Word format, to Prof. A.J. Wickham: <u>mailto:confer@globalnet.co.uk</u> The initial deadline for submissions is February 21st, 2014.

Approximately 25 oral presentations (20 mins + 10 mins discussion) will be accepted, for which a full paper will be required by the date of the conference for subsequent publication in the proceedings volume which all delegates will receive. A template for the full paper will be provided upon acceptance of the abstract.

A new feature of this 4th conference will be four parallel discussion sessions on the following topic areas:

- Aligning the Modelling and Statistics with the Science (led by Dr Philip Maul, Quintessa)
- Microstructural Modelling and Examination (led by Prof Peter Flewitt, Bristol)
- Relating Experiments to Core Modelling (led by Prof Colin Taylor, Bristol)
- The Best Use of Reactor Sampling and Inspection (led by Dr James Reed, EdF)

These sessions will debate the topics thoroughly and produce a report which will be presented on the final day of the conference and will subsequently be written up as part of the published proceedings. During registration, delegates will be invited to select their preferred topic area: however, to ensure that each topic is evenly supported, a final allocation will be made at the start of the conference.

Registration forms will be available at the beginning of 2014: potential delegates are meanwhile invited to confirm their interest with Prof Wickham at the above e-mail address or via 01597 860 633.

Delegates will enjoy excellent food and accommodation, and also an optional tour of the unusual sights of the centre of Nottingham including the industrial caves and the 'Trip to Jerusalem' Inn.

The meeting is supported financially by EdF Energy, Amec, NRG Petten, Frazer-Nash Consultants, Atkins, and ONR, and will be administered through The British Carbon Group.





28-30 July 2014-Sheffield, UK

Call for oral abstracts deadline: 18 November 2013

Introduction

Carbon is ubiquitous in electrochemical research and has played an important role in the development of the discipline. Carbon paste and glassy carbon electrodes have been indispensable in electroanalysis as cheap alternatives to noble metals. The development of the carbon fibre microelectrode revolutionised the use of electrochemical measurements in investigating biological function. In recent years the use of carbon in more novel forms (e.g. carbon nanotubes, graphene) has impacted on all areas of fundamental and applied electrochemistry and this is likely to continue into the future. Advanced electrochemical techniques such as scanning electrochemical microscopy, electrochemical AFM and spectroelectrochemistry have moreover increased our understanding of the interfacial properties of traditional carbon electrode materials.

Carbon also plays an important role in technologically applied areas of electrochemistry - in energy generation and storage and catalyst support. The use of carbon electrodes thus spans a range of disciplines, requiring input from materials chemists, engineers and physicists as well as those engaged in more traditional aspects of electrochemistry. The subject area is of both academic and technological relevance. The discussion will be of relevance to several of the RSC roadmap priorities, particularly energy, underpinning chemical science, water and health.

Aims

This meeting aims to provide an opportunity for researchers from different backgrounds and disciplines to interact.

Themes

- Graphene, carbon nanotubes and carbon at the nanoscale
- Diamond and sp3 carbons in electrochemistry
- Carbon electrodes in electrochemical energy technology
- Understanding and controlling the carbon interface

Sponsor

We would like to thank the following organisation for their support of Faraday Discussion 172:



Contact and Further Information

RSC Events

Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge CB4 0WF, UK Tel: +44 (0) 1223 432254 / 432380 Fax: +44 (0) 1223 423623 Email: RSC Events

New Advances in Carbon Nanomaterials: Faraday Discussion 173

Date: 01 September 2014 - 03 September 2014

Venue

Burlington House Piccadilly London W1J 0BA United Kingdom

Organiser(s): RSC Conferences Department

Faraday Division

Chilterns and Middlesex Local Section

Contact for Event Information

Email: events@rsc.org

The British Carbon group is a sponsor of this discussion

Other meetings of interest

CONFERENCE ANNOUNCEMENT AND CALL FOR PAPERS FOR THE COAL RESEARCH FORUM'S BIENNIAL "10th EUROPEAN CONFERENCE ON COAL RESEARCH AND ITS APPLICATIONS" TO BE HELD AT THE UNIVERSITY OF HULL ON 15th-17th SEPTEMBER 2014.

Conference Announcement and Call for Papers for the Coal Research Forum's biennial conference, "10th European Conference on Coal Research and its Applications" to be held at the University of Hull on 15th-17th September 2014. For further details, please see the conference website, www.constableandsmith.com/coalresearch.

News and reports of meetings

Sustainable Carbon Management, Imperial College, November 16th 2013

This meeting had been planned for the Spring of this year but for various reasons had effectively to be an Autumn meeting. It was attended by just over 40 participants and was organised by Dr Geoff Fowler with some distant assistance from me. The principal theme of the meeting was how carbon can be used in such a way as to minimise emissions of carbon dioxide by careful recycling, how it is produced commercially and radical new ways that it can generate power.

After an informal buffet lunch, which was a useful way for the delegates to meet each other and for old friends to renew acquaintances, the meeting was started by the presentation of a plaque to the 6th Ubbelohde lecturer, Prof. Francisco Rodriguez-Reinoso by our Chairman, Malcom Heggie after which the lecture was delivered.

During the tea interval, we held the 2013 AGM of the British carbon Group. The minutes of the meeting are included after this report, so I need not elaborate on them. After the scientific session, to mark an occasion that had seen several distinguished visitors, among them Profs. Peter Thrower, and John Patrick as well as some Spanish carbon researchers who had come in support of the Ubbelohde lecturer, we had a wine reception by courtesy of Jacobi Carbons , to whom we are vert grateful. This was an excellent opportunity to renew old friendships and to make new ones and was very fitting end to what was a most successful meeting.

After the Ubbelohde lecture, Geoff Fowler from the Civil and Environmental Dept of the College talked about the work he had been doing on recycling tyres. Disposing of old tyres in a responsible manner is a major problem in Europe. They are quite complex structures but the organic component makes up a large part of them and is potentially recyclable. Carbon black is a widely-used filler for tyres, up to about 28% w/w. In the lab., his group had stripped off the used rubber and carbon with

a water jet working at 2800 bar pressure. This produces very fine tyre crumb, the size of which can be controlled according to the experimental condition. SEM images show it to be relatively smooth but it none the less blends well with other rubbers for re-use. The larger-sized material that cannot be used directly is pyrolysed. They had found microwave heating to be very effective, provided that the material was rotated to avoid local over-heating. The surface area of the carbon produced was ~ $80m^2/g$, about comparable with conventional carbon blacks but there was more ash than for a conventionally-pyrolysed rubber char. Their latest experiments had resulted in setting up a continuous microwave facility for treating rubber crumb before proceeding to commercial trials.

We then had a very interesting presentation by Mark Downs of Jacobi Carbons on how active carbon was obtained from coconuts. Coconut trees are extensively farmed in Sri Lanka, which is the Company's main source, either by individual farmers or by co-operatives. They crop 3-4 times a year and provide many products both for use in Sri Lanka and for export. Most of the meat is used locally for cooking and eating as is the oil. The outside is used for coir matting and is a major export for the country. Coconuts are thus an important part of the Sri Lankan economy.

The shell, which is what gives us our active carbons, used to be discarded as a waste product. Today it is carbonised in large pits to give the raw material, the yield from the shell being about 30%. This is clearly a very cheap way of making the carbon but a continuous carboniser would improve quality. Activation of the carbon by steam takes place in rotary kilns at 900-930^oC. The heat for the process is provided by injection of air at stages along the length of the kiln to avoid local hot-spots. The residence time is 10-12 hours. The product is crushed and screened before being exported.

The whole process is thus as ecologically-friendly as possible with relatively few net carbon dioxide emissions. Ironically, these could be reduced even further if the off-gas from the activation process could be used for power generation but the wind-powered electricity generation is so wide-spread in Sri Lanka that there is no market for any other form of generation.

The last talk was by Paul Fennell of the Chemical engineering Dept. at IC and dealt with the problem of how to produce energy from carbonaceous fuels without adding to the CO₂ already in the atmosphere. He reviewed very briefly existing technology, effectively "end of pipe" technology, for dealing with the problem. Washing out CO₂ post-combustion by amine absorption did not seem to him to be a solution when the technical problems, cost and degradation of efficiency are taken into account (I totally agree). Similar technology applied to combined cycle generation using natural gas might be a different matter. We also have the problem of storing the CO₂ when it is separated and he commented that this was something that needed to be addressed urgently.

The main thrust of his talk dealt with looping as a means of overcoming these problems. At present much attention has been paid to using limestone as a looping agent.



As the diagram illustrates, CO_2 is removed by CaO, which is produced from limestone heated by combustion of coal in oxygen. The energy is extracted from the system by heat transfer from exothermic CO_2/CaO reaction and the hot CaO/CaCO₃ which is recycled back to the calciner unit. The technology had a number of advantages. Limestone is cheap, it is fairly stable thermally and survives a number of cycles with adequate activity and in the end, the spent lime can be used to make cement. Pilot plants at the 100kWth level had operated and it was currently being tried out in Spain at the >1MWth scale.

One of the disadvantages however was the need for an air separation plant. Chemical looping avoids this.



In such a reactor, oxygen is the looping agent transferred in the form of a reducible metal oxide, the oxides of iron being an example.

The reaction side can be represented by:

 $3Fe_2O3 + CO \rightarrow 2Fe_3O_4 + CO_2 \qquad \Delta H - 43.2 \text{ kJ/mol}$

 $3Fe_2O_3 + H_2 \rightarrow 2Fe_3O_4 + H2O \qquad \Delta H - 2.7kJ/mol$

The corresponding oxidation would be:

$4Fe_3O4 + O_2 (+N_2) \rightarrow 6Fe_2O_3 (+N_2)$ $\Delta H - 479.5 kJ/mol$

The advantage of chemical looping like this is that no air separation unit is needed and the process being carried out at high temperature with no cooling involve at any stage is thermodynamically more efficient.

In conclusion, he said that he pointed out that the imbalance between the amount of CO_2 produced by combustion, direct or indirect, was much greater than the potential for its use as a raw material in the chemical industry. This, added to the thermodynamic penalty of such schemes, ruled it out for this. On the other hand, the need to press on with methods of storing it permanently was urgent and pressing.

Norman Parkyns



Prof. Francisco Rodriguez-Reinoso gives the 6th Ubbelohde lecture.

The photo shows Prof. Malcom Heggie, Chairman of the British Carbon Group presenting to Prof.Rodriguez-Reinoso the Certificate in recognition of his giving the 6th Ubbelohde Lecture at the recent meeting "Sustainable Carbon management" at Imperial College on 6th November 2013. In making the presentation, Prof Heggie said that it was founded by the BCG to honour the memory of one of the leaders in carbon science in Great Britain in former years. Prof. A R Ubbelohde had a distinguished academic career, initially at Oxford but then at Queen's University, Belfast and finally here at Imperial College, in the Dept. of Chemical Engineering. He had a wide range of active research interests but is known to us for his work on graphite.



Photo courtesy of Prof Harry Marsh

His pioneering work on Highly Orientated Pyrolytic Graphite was carried out while he was at Imperial College. He was a founder of the SCI's Industrial Carbon and Graphite Group, one of the precursor groups of the British Carbon Group and was the inspiration behind the famous London Carbon and Graphite conferences, which together with those that his friend and colleague Prof. Mrozowski, pictured with him in the photo, at Buffalo organised in the United States, became the International Carbon Conferences we have today. The BCG has inaugurated the Ubbelohde lectures to honour his name, the first of which was given by Sir Harry Kroto at Carbon 2006 at Aberdeen.

Prof.Rodriguez-Reinoso has researched on a wide range of carbon materials (structural, porous, catalysts, etc.), in which he has an international reputation. He has been Supervisor of 50 Ph.D. thesis (20 on activated carbon/adsorption, 8 on carbon-related catalysts, 9 in structural carbon materials, 5 on non-carbon catalysts, 3 on composites and 5 on miscellaneous materials). At the University of Alicante he has been responsible for a total of over 120 research projects and industrial contracts. He has over 350 articles published in refereed journals and has given a large number of plenary and invited lectures. Among these he has received awards from the Japan Carbon Society in 2008 and from the American Carbon society in 2010. He has had a long-standing relationship with the carbon industry and has received much funding from EU projects. He has been an Editor of "Carbon" from 1991 to 2012.

6th Ubbelohde lecture "The uniqueness of activated carbon for gas separation and storage"

Prof. Rodriguez-Reinoso started his lecture by saying that he had personal recollections of Prof. Ubbelohde and had worked at an early stage of his career on Highly Orientated Pyrolytic Graphite (HOPG), first produced in Prof. Ubbelohde's laboratories, not far from where he was speaking, in the department of Chemical Engineering at Imperial College.

Nanoporous carbons are uniquely flexible in that their porosity can be tailored. One notable feature is for the surface to be changed from hydrophobic to hydrophilic by suitable doping. Increasing activation by selective removal of carbon atoms leads to surfaces of quite different properties. The characteristic slit-shaped pores can accommodate very high adsorption densities.

Carbon molecular sieves (CMS) have been used commercially for many years. They can discriminate sharply between for example, n-butane and i-butane in their adsorption isotherms. By contrast, nitrogen and oxygen adsorb to similar extents at equilibrium but the rate of uptake is markedly different and this leads to the commercial process for separating pure nitrogen from the air by a cyclic process of adsorption and desorption. CMS can be made either by selectively oxidising nanoporous carbons or by selectively adding carbon atoms by chemical vapour deposition (CVD). In the first case, surface groups are removed selectively and in the second, the added atoms block off pores that would otherwise be non-selective for separation by adsorption. Carbon burn-off can also be affected by treating the precursor carbons with water. The commercially valuable separation of methane and carbon dioxide can be effected by CMS, the ratio of CO_2/CH_4 being potentially very high. The disadvantage of using CMS is that the adsorption capacity is often rather low although there is potential for improving this.

Another potentially important process that Prof. Rodriguez-Reinoso has worked on was that of storage of adsorbed natural gas (ANG). Much work had been done in this area over the years. The initial target of storing 150 volumes gas/volume of carbon at 34 bar had been achieved but a newer target of 266v/v at 250 bar, set by the US Department of Energy (DOE) in 2012, would be much harder to reach. It would seem from modelling studies that slit-shaped pores of 0.8 nm would produce the best results. This implies a nanopore volume of 0.6 cm³/cm³ carbon. Metal organic Framework (MOF) materials had attracted a lot of attention recently as potential adsorbents for ANG but although they were able to store large amounts of gas per unit mass within the lattice framework, their uptake/volume of adsorbent, which is critical in this field, does not look good enough.

His group had looked extensively at optimising carbons from olive and peach stones for ANG. Normally, they obtained values of 100-120 v/v by conventional activation but had improved considerably on this. As remarked above , it was essential to maximise nanopores of the right diameter and to reduce all unproductive volume from the adsorbents . They had succeeded in pressing together the carbons into solid discs without the need for a binder and the best samples had given uptakes of 160 v/v although the uptake was very slow. The best results were obtained by heating with KOH and the total volume obtained was linear with the K content. Finally, he mentioned that they had looked at the possibility of using methane hydrates as storage medium. Water was pre-adsorbed on the carbon surface: subsequent admission of methane showed that the reversible formation of hydrates at specific pressures.

Festschrift for Emeritus Prof. K S W Sing



Presentation by current editor of Adsorption Science & Technology, Dr Erich Müller, Imperial College, London.

A special issue of Adsorption Science & Technology was dedicated to Professor K.S.W.Sing, in honour of his 65th year of active work and research in the field of adsorption as well as to coincide with his 88th birthday. A total of 13 invited papers from former doctoral students and colleagues were presented from all corners of the globe. The collection of articles recognised his many contributions in the areas of physisorption, characterization of porous materials, discovery of novel materials and his influence on the field in general.

One of the true pioneers in the field of adsorption with links to the likes of Kiselev, Brunauer and Dubinin to name but a few. There is probably not a University in the world without a copy of the book he co-authored with the late Dr John Gregg on Adsorption, Surface Area and Porosity. Still a prolific writer, the second edition of Adsorption by Powders and Porous Solids with Rouquerol, Rouquerol, Llewellyn and Maurin has just been published.

For his contributions to adsorption by activated carbons, Prof Sing was awarded the British Carbon Groups 4th Ubbelohde Memorial Lecture.

He was the founding editor of the Adsorption Science & Technology journal, former vice president of the Society of Chemical Industry and Chairman of SCI Publications and Awards Committees. He is also a present member of the SCI Council.

For further details on Prof Sing's career and publications please see Adsorption Science & Technology, Volume 31 (Nos 2&3), 2013.

Peter Branton

News from the Australian Carbon Society

I have got this from Prof. Irene-Suarez-Martinez. It's rather late to attend their December meeting but we wish them well $_{ndp}$



The Australian Carbon Society is network of over 120 researchers from academia, research organisations and industry, and from a wide range of disciplines, including the chemical sciences and engineering, physics, biology, earth and environmental sciences and agriculture. We are a division of the Royal Australian Chemical Institute: <u>https://www.raci.org.au/divisions/carbon-division</u> The society email address is <u>AustralianCarbonSociety@gmail.com</u>. The Chairman of the Group is Prof. Mark Biggs.

We run a two-day annual meeting, OzCarbon. This year it will take place during our southern hemisphere summer in Melbourne on the 1st -3rd December.

Nassia Tzelepi

Nassia has just been elected on to the committee of the BCG (See AGM minutes). She is the Technical Lead for Graphite Technology at the National Nuclear Laboratory. Nassia has a MSc in Energy Systems from the University of Strathclyde and a MBA with the Hellenic Open University. She has 13 years' experience in the wider energy industry, 9 of them on nuclear graphite. Nassia's main research theme is understanding graphite behaviour under irradiation and oxidation and over the years she has successfully developed measurement techniques for irradiated graphite, led graphite thermal oxidation studies and has been actively involved in various graphite projects ranging from core safety case reviews to micromechanistic model development.

More recently, she has been involved in graphite waste management and treatment studies and is also a Visiting Teaching Fellow in Nuclear Engineering at the University of Central Lancashire

Report of the 9th European Conference on Coal Research and Its Applications

The ninth biennial coal research conference organised by The Coal Research Forum was held at the University of Nottingham in early September 2012. This was the second time that the event had been hosted by Nottingham having previously been held there in 1998.

The main aim of the event, formally known as the 9th European Conference on Coal Research & Its Applications or ECCRIA9 is to bring together researchers in universities with participants from industry, who are carrying out research or are interested in the application of this research in industry. The policy of the conference organisers is to cost the event in such a way as to encourage the attendance of research students who will most benefit from the opportunities to showcase their work and to network with other researchers.

The conference was held from Monday 10th to Wednesday 12th September at the Jubilee Campus Business School in the South Building.

The welcome address was given by Professor Sam Kingman who is Research Dean for the Faculty of Engineering at the University of Nottingham. The conference keynote speaker was Dr John Topper, Director of IEA, Clean Coal who gave a very interesting talk entitled "Outlook for Coal World-Wide".

A full programme of oral presentations covered two and a half days in which 73 papers were given in 9 parallel sessions. The themes of the conference A sessions were Oxyfuel combustion; carbon capture and storage and biomass co firing and the B session themes were coal-derived products; corrosion ash and deposition; gasification and Fischer Tropsch synthesis; underground coal gasification; emissions and their control; IGCC and pre-combustion and characterisation.

A poster session of fifteen papers was held on Monday evening in conjunction with a buffet dinner served in the in the South Building foyer.

A total of 113 delegates attended the conference. In addition to a large contingent from the UK there was representation from a number of European countries such as Spain, Italy, Germany, Greece, Poland, Denmark and Finland with some long distance travellers from India, China, Japan, Malaysia, and Russia.

The Conference Dinner was held on Tuesday night in the impressive surroundings of Senate Chamber of the Trent Building. This venue provided a very pleasant atmosphere in which an excellent meal was enjoyed by all.

The conference was formally closed on Wednesday lunchtime by Professor Colin Snape who is the Director of the Energy Technologies Research Institute, Faculty of Engineering at the University of Nottingham. Colin thanked the delegates for attending and hoped they had enjoyed the latest ECCRIA conference. However, unlike in the recent Olympic Games closing ceremony he was unable to hand over the baton to the next conference organiser as the venue is still to be finalised!

> Alan Thompson Newsletter Editor Coal Research Forum

Roger Taylor Award 2013

The Roger Taylor Award for 2013 to the value of £750 was awarded to Alexey V Verkhovtsev by Prof Malcolm Heggie at ACNS 2013 at St. Petersburg for his paper entitled "Electron excitations in photo-

and electron-impact ionisation of Fullerenes. This is the first time that the British Carbon Group has made the award, which was set up last year in memory of the late Prof. Roger Taylor.



Alexey Verkhovtsev studied physics at St Petersburg State Polytechnic University, where he obtained his master's degree. He is currently working forhis PhD at Frankfurt Institute for Advanced Studies, Goethe-University, Frankfurt am Main, Germany. His project is "Application of many-body theory to the photoionization of endohedral fullerenes" and his Supervisor isProf. Dr. Andrey V. Solov'yov.

Brian Kelly awards 2013

Two awards were made this year at Carbon 2013 at Rio. One went to Dr Vilas G Pol for his paper on Structural evolution of carbon spheres electrodes for lithium battery applications. The other was awarded to Dr. Wei Lv for his paper Graphene oxide membrane with hierarchical structure self-assembly at liquid/air interface: high absorption and energy storage performance.



The pjotos show Dr Wei Lv (left) and Dr Pol (right) being presented with their awards by Prof Malcolm Heggie at the conference

THE BRITISH CARBON GROUP

Minutes of the 2013 AGM held at Imperial College, London, 6th November 2013.

Present

Malcolm Heggie (Chairman), Norman Parkyns (Vice Chairman), Tony Wickham (Hon. Treasurer), Peter Minshall (Hon Secretary), committee members Peter Branton, Geoff Fowler, Steve Ragan and 8 BCG Members

Apologies for Absence

John Fisher, Ian Kinloch, Steve Tennison and Ray Whitby.

Minutes of the Last AGM

The minutes of the previous AGM, held on December 20th, 2012 at the University of Manchester were accepted as a true record. [Proposed: Steve Ragan, seconded: Tony Wickham, accepted *nem con*.]

Matters Arising

There were no matters arising.

Chairman's Report

May I start by welcoming you all to the AGM and expressing my appreciation for your support of the BCG? My 10 months back in office has gone by very quickly, and I have been glad to have an engaging and committed team behind me. Clearly, my predecessor, Dr Gareth Neighbour, was very effective in keeping the BCG healthy, ambitious and strong. Thank you Gareth.

We have got into the situation where our annual AGM was at Christmas and this required us to report activities in the year before, not the year up to the AGM. This meeting is evidence of a slow migration of the AGM toward the beginning of the year. Thus, here we report the activities and finances up to 2012, and then update you with the activities in 2013 to date. For those of you at the 2012 AGM there will be faint echoes of the words of the previous Chair.

The main activities of the BCG are rewarding and promulgating excellent carbon science, which it does through its awards and meetings.

The Brian Kelly Award 2013

The BCG administers an award to remember the late Brian Kelly from a fund raised by his friends and colleagues. Brian was a world authority on graphite, author of the '*Physics of Graphite*' (Applied Science Publishers, 1980) and many erudite research papers on graphite.

This year there was a very strong field of applicants and the decision was made to award two prizes of £500. The first award was to Dr. Vilas G. Pol for his paper *Structural evolution of carbon spheres electrodes for lithium battery applications* and the second to Dr. Wei Lv for *Graphene oxide membrane with hierarchical structure self-assembly at liquid/air interface: high absorption and energy storage performance.* It was a pleasure for me to make the award to them at Carbon2013 in Rio de Janeiro. I did, however, baulk at the Hon Treasurer's suggestion that I walk the streets of Rio with their cash awards in my pockets.

The Roger Taylor Award 2013



Emeritus Professor Roger Taylor (1935-2006)

In 2013 we have been proud to inaugurate the Roger Taylor award, in memory of the distinguished fullerene chemist, the late Professor Roger Taylor from Sussex University. This is funded by a generous donation from his family. Because of his long association with the fullerene and nanocarbon meetings organized by the loffe Institute in St Petersburg (now known as ACNS meetings), the first award was for an abstract submitted to that meeting in July. The cash award of £750 went to Alexey V. Verkhovtsev for his paper: *Electron excitations in photo- and electron impact ionization of fullerenes.*

The award in 2012 was to Fei Guo of Brown University in the USA, as noted in Gareth Neighbour's report last year.

The committee and I congratulate all four award winners and look forward to another competitive round in 2014.

The Ubbelohde lecture 2013

Prof. A R Ubbelohde was a pioneer of graphite science, amongst other things, especially in the development of Highly Orientated Pyrolytic Graphite (HOPG). He was a founder of the Industrial Carbon and Graphite Group, one of the fore-runners of the BCG, and initiated meetings in the UK which evolved into the World Carbon Conferences we know today.

We are very pleased that Prof. Francisco Rodríguez-Reinoso of University of Alicante accepted our invitation to present the 2013 lecture and he spoke very eloquently to his theme *"The uniqueness of activated carbon for gas separation and storage"*, giving insight, understanding and realism. We were delighted to host a contingent of six colleagues from Alicante to mark this important event.

Meetings

The 2012 programme comprised three successful meetings which are given here with the number of participants and the name of the Chair in parentheses: *Real World Applications of Carbon* (50, Dr Peter Branton), *NanoteC12* at Sussex (81, myself) and the *Xmas meeting* at Manchester (35, Dr Gareth Neighbour).

Our 2013 programme likewise comprises three meetings, one of which is the present one *Sustainable Carbon Management* (41, Dr Geoff Fowler and Dr Norman Parkyns). It has gone exceedingly well, and it was pleasing to see distinguished colleagues such as Profs. Brian McEnaney, Peter Thrower and Katsumi Kaneko in the audience, as well as key figures in the UK activated carbon academic and industrial community.

I and my group moved University from Sussex to Surrey last autumn, so it was a pleasure to bring NanoteC13 to Surrey University (61, myself). As usual I rely heavily on my team at Surrey and on the Hon Treasurer for the organization, and they have my gratitude for this. One feature of the meeting was a two day workshop to widen participation in computer modelling. This was co-sponsored by Collaborative Computational Project No. 9 of the Engineering and Physical Sciences Research Council, chaired by Prof Mike Payne at Cambridge. I feel it was very successful in bringing experimentalists and theoreticians together, working on graphene. Thanks are due to CCP9 for their support.

Coming soon, 18th December, there will a half day meeting in Manchester, on graphene, which is being opened by Dr Irina Grigorieva from the Graphene Centre, Manchester. It promises to be an intense afternoon of contemporary science.

Finally, it is gratifying to see the importance of carbon being recognized in two Faraday Discussion. FD172 on Graphene Electrochemistry and FD173 New Advances in Carbon Nanoforms. The latter is to be held in London next year from Sep $1^{st} - 3^{rd}$ and is cosponsored by the BCG. For information on these meetings and other interesting links, please go to the website (www.britishcarbon.org).

Treasurer's Report

The accounts for 2012, in the RSC format, were presented by Tony Wickham.

Total income was £74,874.43 and total expenditure was £69,734.31. The balance on 1st January, 2012 was £48,437.31 and on 31st December, 2012, £53,577.43. There was thus a surplus of £5,140.12 for the year.

As the flow of funds was greater than £70k, the Group remained registered for VAT.

In 2012, 72% of the Groups funds were invested in an RSC deposit account, yielding 2.3% annual interest. The balance was placed in a fund with short term access.

At the end of 2012 the Brian Kelly Award fund stood at about £14,000 and the Roger Taylor Award at about £3,700.

The final account for the EDF Graphite Conference in November 2011, showed a surplus of $\pounds 8,117$. This will be used to support the 4th Meeting, to be held in 2014.

NanoteC 2012 made a surplus of £1,138 and the Xmas meeting, at Manchester, cost £848. This latter meeting was free to members, and thus this deficit was anticipated.

The Group continues to be troubled by fraudulent Direct Debits, although none have been made in the last six months.

The Group made a contribution to the European Carbon Association of £165 for the ECA Carbon Award.

To Receive Notice of the Representatives of the Sponsoring Bodies

The following will be notified to the sponsoring bodies as representative for 2014:

RSC	Norman Parkyns
IOP	Peter Minshall
SCI	Geoff Fowler

Election of Officers and Committee Members

As no nominations for Treasurer had been received, the meeting agreed to suspend standing orders and appoint Tony Wickham [proposed: Peter Minshall, seconded: Malcolm Heggie] for a further term of office.

Nassia Tzelepi was proposed by Tony Wickham and seconded by Peter Minshall as a member of the committee.

Any Other Business

There being no other business, the meeting closed at 3.45pm.