PRIFYSGOL ABERYSTWYTH UNIVERSITY

PRIFYSGOL BANGOR UNIVERSITY

Centre for Advanced Functional Materials and Devices

Annual Report

2009

Centre for Advanced Functional Materials and Devices

www.cafmad.ac.uk

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Annual Report 2009

Overview

Welcome to this third report for the Centre for Advanced Functional Materials and Devices (CAFMaD) that reports the Centre's activity during 2009.

The £2.9M Centre for Advanced Functional Materials and Devices (CAFMaD) is part of the Aberystwyth University and Bangor University Research & Enterprise Partnership. The Partnership was awarded HEFCW funding of £10.9M from 2007 to 2011 to provide research and entrepreneurship support across the Universities and to create four internationally recognised research Centres, of which CAFMaD is one.

CAFMaD brings together leading academics from the Institute of Mathematics and Physics (IMAPS) and the Welsh Visualisation Centre at Aberystwyth University, and the College of Physical and Applied Sciences at Bangor University, which includes the School of Chemistry, the School of Electronic Engineering and the School of Computer Science.

CAFMaD's strengths are in materials, sensors, mathematics, space physics, synthesis and catalysis, molecular modelling, visualisation, image recognition, characterisation, photovoltaics, biological chemistry, optoelectronics and high performance computing. Aberystwyth leads in glasses and ceramics, semiconductor surfaces and interfaces, advanced characterisation techniques and stereo reconstruction and modelling of solids and surfaces. Bangor leads developments in optoelectronics and solar cell technology, materials synthesis and catalysis, polymer processing, polymer electronics, micro-nano-fabrication and molecular modelling.

CAFMaD's Vision is to be an international centre of excellence for the development, characterisation and application of advanced materials and devices, and CAFMaD's Mission is to be an international centre of research excellence based on pure science and capable of delivering sustainable economic growth in Wales, the UK and beyond.

CAFMaD is managed by an executive group consisting of the Co-Directors, Professor Neville Greaves and Professor Martin Taylor, and is Chaired by Gary Reed, Head of the Partnership Office. A management group consisting of all CAFMaD members meets every six months and the External Advisory Board (EAB), drawn from leading Physics, Chemistry and Engineering Institutes across the UK, with representation from the Welsh Assembly Government and industry, meets annually. The EAB is Chaired by Professor Mike Scott from IQE Plc.

This Annual Report presents the activities of the research streams, the publications and conference attendance by CAFMaD members, and research grants awards.

	2009	2008	2007
Publications	46	38	54
Workshops	3	2 (+2)	4

Grant Capture	Cumulative Total to the end of 2009	Cumulative Total to end of 2008	Total to end of 2007
Total Awards core CAFMaD	£5,738,327	£4,475,000	£2,272,000
Joint AU and BU	£518,334	£443,000	£77,000
CAFMaD Members	£2,,884,769	£1,850,211	£793,000

During 2009 CAFMaD built on its previous success with positive and encouraging reports from the External Advisory Board and the Research and Enterprise Partnership Board. Research fund acquisition in core CAFMaD areas has been positive, some of the highlights include:

- A TSB-funded project on printed security tags that was secured by Professor Martin Taylor and colleagues, this led to an EPSRC-funded Innovative Electronic Manufacturing Research Centre (IeMRC) with a grant of £1.2M. Both projects include significant industrial collaborators.
- Work on the HEFCW/A4B-funded Ellipsometer has continued with the build of a demonstrator instrument; this attracted a positive evaluation from Accurion/Nanofulm Gmbh, one of Europe's leading manufacturers of ellipsometric instruments.
- An optical calibration-target device for the ExoMars project is being developed in CAFMaD, with samples of coloured glass prepared and undergoing calibration. These glasses with obviously have to be designed to survive extreme environments and interest from other target markets is possible.
- A successful joint CAFMaD seminar series continued, culminating in a CAFMaD and IeMRC hosted event at Technium CAST in Bangor on 'Innovative Electronic Materials' attended by over 20 leaders from industry and academia.
- CAFMaD's investment in early career academics is reaping rewards; for example, Dr Greg Chass added nine papers to his total of over 50 papers in internationally peer reviewed journals. His most recent and relevant co-authored publications have respectively been designated the most downloaded article of 2006 (*Chem. Eur. J.*, **12** (2006), 4743) and co-corresponded „hot article" (*Angew. Chem. Int. Ed.*, **48** (2009), 6836) – the findings highlighted in Nature Chemistry ((2009),) and Chemical & Engineering News (C&E News, **87**(35) (2009), 02 Sept), the most widely distributed and read industrial journal.
- Grant income across all research streams since the conception of the project in 2006 reached £5.7M, with an additional £1.26M from 2008 activities included in that annual report.
- A high level of Joint Central Facilities access at Diamond Light Source, ISIS (Rutherford Appleton Laboratory) and ILL, Genoble.

- A range of international research collaborations and strong links developed with the National University of Singapore and Nanyang Technical University in Singapore, which led to the Development of the British Council International Network of Young Scientists initiative and conference in Singapore in July 2009:

  A three and a half day meeting on Advanced Materials and Devices was jointly and successfully held between scientists from Singapore and the UK. This meeting was partly hosted by the prestigious International Conference on Materials for Advanced Technologies (ICMAT) 2009. The Advanced Materials and Devices meeting was funded by British Council as part of the International Networking for Young Scientists (INYS) funding initiative. Match funding was provided from the UK by the Higher Education Funding Council for Wales, UK (HEFCW) through the Centre for Advanced Functional Materials and Devices (CAFMaD). Funding from Singapore came from the National University of Singapore (NUS), Nanyang Technological University (NTU), and the Singapore Synchrotron Light Source (SSLS). The meeting attracted about 50 scientists from Singapore and the UK at roughly a 2:1 ratio. The primary focus of the meeting was to establish links between early career researchers in Singapore and the UK as well as to explore joint project and funding opportunities.

  The meeting was jointly organised by National University of Singapore (Dr CHEN Wei), Nanyang Technological University Singapore (Dr Andrew Grimsdale), Singapore Synchrotron Light Source (Dr Agnieszka and Dr Krzysztof Banas), and the Centre of Advanced Functional Materials and Devices represented by Aberystwyth University (Dr Florian Kargl), and Bangor University (Dr Gregory Chasse and Dr Justin Lawrence). The senior advisers to this meeting were Prof Neville Greaves (Aberystwyth University) and Prof Herbert Moser (SSLS).

  From this meeting, four joint project initiatives have emerged and one joint-publication is nearing completion. As a result of these initiatives, two researchers from NUS have been invited to Aberystwyth University to follow up discussions on joint planning of a new project. Moreover links have been established which seek to enable young researchers from Singapore to take postdoctoral positions in the UK and young researchers from the UK to take postdoctoral positions at Singapore. Furthermore, the INYS meeting was very well recognised by the ICMAT organizers and the INYS organizers were invited to develop this meeting into a full official symposium for young scientists on Advanced Materials and Devices during ICMAT 2011, in Singapore.

It is a pleasure to report successful progress for CAFMaD in 2009.

Gary Reed
Chair of CAFMaD Executive Committee
Head of the Partnership Office

CAFMaD Team Workshop, January 2010

CAFMaD

Research Groups

2009

Organic Electronics

Team Leaders: Professor Martin Taylor; Professor Andy Evans

Members: Dr Mohammed Mabrook; Dr Dave Langstaff; Dr Nigel Poolton

Areas of Focus:

- Polymer and Small Molecule Electronics
- Contact Formation

Following a period of intense investigation of interfaces in MIS diodes and thin film transistors, the Organic Electronics team at Bangor is now shifting its emphasis more towards applications. This has been prompted by several successful grant proposals. Firstly, TSB funding (~£60K) allowed Professor Taylor to join a collaboration including Oxford University and several companies interested in developing printed RFID security tags. A key element of any security tag is a ring oscillator which generates the clock frequency which controls the logic operation. Figure 1 is a microscope image of a 9-stage ring oscillator designed in Bangor and fabricated in Oxford University.

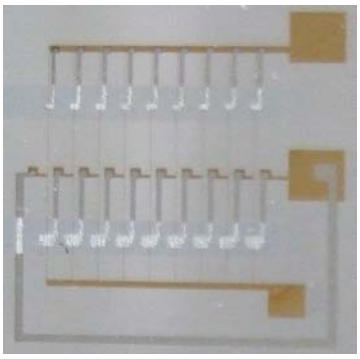


Figure 1 *An organic-based ring oscillator designed in Bangor and fabricated in Oxford as part of the TSB-funded project on active security tags.*

The results from this project led to a successful Innovative electronic-Manufacturing Research Centre (IeMRC) Flagship grant proposal for over £1.2M shared between Oxford, Manchester, Leeds and Bangor Universities with £255K coming to Bangor. This new funding extends the initial collaboration to include more Universities but also additional key industrial players including users of intelligent packaging. The focus of the new research will be to develop vacuum-based roll-to-roll printing of functioning electronic modules that will ultimately be used in large scale production of flexible circuits. Bangor's role will be to design circuits and circuit layouts to suit the fabrication process. Additionally, Bangor will fabricate model circuits under Clean Room conditions to establish benchmark performance against which to compare circuits fabricated under 'industrial' conditions. Both the TSB and IeMRC successes and a recent submission of a proposal for a short-KTP project with a local SME to the Welsh Assembly's A4B programme resulted from an earlier A4B investment of £200K which allowed Professor Taylor to purchase a nitrogen glovebox incorporating an organic evaporator and spin-coater (Figure 2).

Figure 2 *Nitrogen glovebox with incorporated organic evaporator and spin-coater*

A second major focus of the work in Bangor is the development of organic memory devices. Currently, two types of memory devices are being investigated:

(a) Flash memory in which the data is stored as charge on a floating gate, the principle as that used in the ubiquitous silicon-based memory stick. Already Prof Taylor and Dr Mabrook have published papers in this field.

(b) Ferroelectric transistor (FerroFET) devices in which data is stored as a change in the polarisation a ferroelectric material. (Such materials are the electrical analogue of a bar magnet and the change in polarisation is equivalent to rotating the magnet through 180^{o}). This programme is being undertaken in collaboration with a team from Potsdam University initiated during exchange visits funded by the British Council.

The Organic Electronics Group at Bangor has active collaborations on organic transistor development with groups in Manchester and in the Johannes Kepler University in Linz, Austria. The group is also beginning to develop activity in 'green' organic electronics with research into organic photovoltaics and a nascent activity in organic light emitting diodes (OLEDs), the latter facilitated by the A4B grant for the nitrogen glovebox and organic evaporator mentioned above. Figure 3 shows an enlarged digital photograph of a 1mm x 1mm OLED being developed as a prototype for display applications.

Figure 3 *Enlarged view of a working OLED. The device was only 1 mm x 1 mm in size and was a prototype for display applications.*

At Aberystwyth, in-situ characterisation of organic semiconductor thin films using photoelectron spectroscopy has revealed new insights into the self-organisation of Van der Waals – bonded molecules on a range of inorganic substrates. Organic Molecular Beam Deposition (OMBD) coupled to a soft x-ray source and efficient electron detector allows photoelectron spectroscopy to be applied in real time to provide the morphology of the organic thin film and the energy band alignment at the organic-inorganic interface in a single experiment (Figure 4). The adsorption and growth of tin (II) phthalocyanine (SnPc) on several substrates has been monitored by recording electron emission from both the substrate and organic layer. This molecule is used for example in small-molecule organic photovoltaic cells in combination with fullerene. Room temperature growth on all substrates reveals strong substrate-molecule attraction for the first layer of molecules followed by a more clustered growth as molecule-molecule interaction dominates. These morphological changes have been deduced from changes in substrate and molecule core levels during thin film growth as illustrated for the Ga 3d core level of GaAs shown in Figure 5. Molecules within the first layer have a distinct orientation with respect to the substrate that is determined by the substrate roughness. This has been determined by the synchrotron radiation technique of Near-edge X-ray Absorption Fine Structure (NEXAFS) spectroscopy through measuring the resonant excitation from core σ to σ^* and π^* molecular states using polarised, tuneable x-rays.

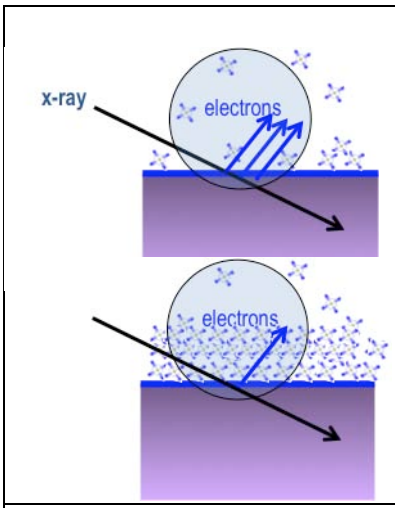


Figure 4: Schematic of the real-time monitoring of molecule adsorption and thin film growth.

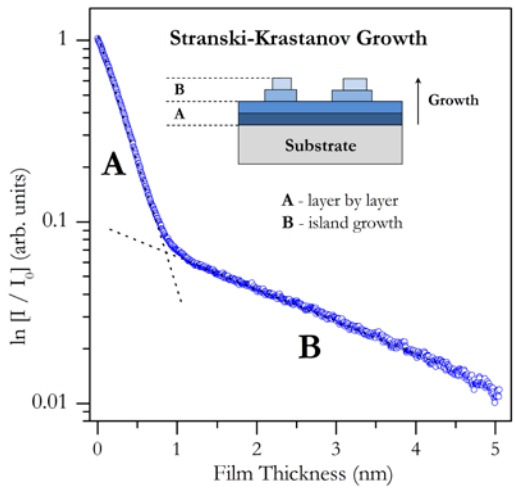


Figure 5: Attenuation of electrons from As atoms in GaAs during exposure to SnPc. The inflection point marks the onset of clustered growth.

The binding energy variation of each core level emission peak during growth has also been extracted and this provides the evolving band bending at both sides of these hybrid interfaces. Valence band edge and secondary electron onset spectra enable determination of the complete energy band diagrams. Shake up features in the C1s core level (Figure 6) reveal internal HOMO-LUMO electronic transitions from which the optical gap is deduced. The intensity of these satellite features are determined by the local density of states for the HOMO and LUMO orbitals as calculated by our collaborators at Newcastle University (Figure 6). Data for SnPc interfaces with many III-V semiconductors provide the transport gap and from these combined measurements a value of 0.6 eV is obtained for the exciton energy in SnPc.

This work was presented in an invited talk at the 13th International Conference on Semiconductor Interfaces in Weimar, Germany in July 2009 and the adsorption of organic molecules on diamond surfaces was presented in an invited talk at the 60th Diamond Conference in Warwick in July 2009.

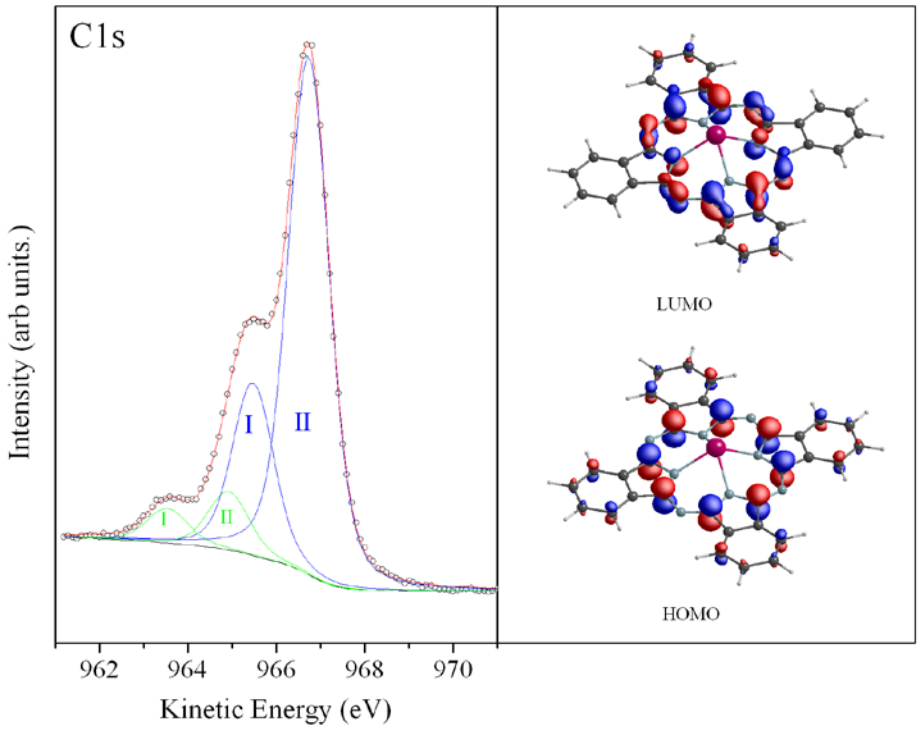


Figure 6: Fitted C 1s core level spectra for SnPc on GaAs showing the two carbon sites in the inner pyrrole ring (I) and the outer benzene ring (II) (blue curves). The associated shake-up satellites (green curves) are displaced from the main peaks by the optical gap. Calculations (right) reveal that the HOMO and LUMO density is located mainly at the inner ring.

Extreme Materials

Team Leaders: Professor Neville Greaves; Dr Peter Holliman

Members: Professor Andy Evans; Dr Florian Kargl; Dr Rudi Winter; Dr Martin Wilding; Dr Edwin Flikkema; Dr Mike Beckett

Areas of Focus:

- Fast ion diffusion
- Glasses at High Temperature and High Pressure
- Melting and amorphisation
- Nanoceramics and sintering
- Radiation-hard semiconductors

The researchers in this stream study inorganic materials, which are interesting from a fundamental point of view as well as for their applications under extreme conditions such as ultra-high temperatures, high pressure, and in harsh chemical environments.

An important aim of this stream's research is to understand how melting and freezing impacts on the structure and properties of materials. Containerless processing employing levitation laser-heating techniques prevents heterogeneous nucleation and is beneficial in extending the range of ceramics and glasses that can be fabricated. These include perfect or low entropy glasses that are likely to have mechanical and chemical properties superior to glasses made conventionally.

Applying high pressure and high temperature simultaneously allows the atomic structure of materials to be studied under deep Earth conditions as well as the severe changes encountered in volcanic eruptions. In experimenting with glasses and liquids under such thermobaric conditions opens the way to the understanding how to develop robust materials.

The same principles involved in fabricating under extreme conditions are also being used to improve and tailor the properties of nanostructured materials capable of sustaining extreme thermal, chemical, and mechanical environments. This is being enabled through novel in situ characterisation methods capable of identifying new synthesis routes.

In designing nanoceramics for enhanced ion conduction, understanding the relationships between structure at the atomic and nano level together with cation and oxygen diffusion is pivotal in refining properties for fuel cells, for example. Likewise research on the atomic and electronic structure of coatings and surfaces of oxides, nitrides and carbides aims to generate the outstanding macroscopic properties needed for robust radiation-hard photovoltaic devices.

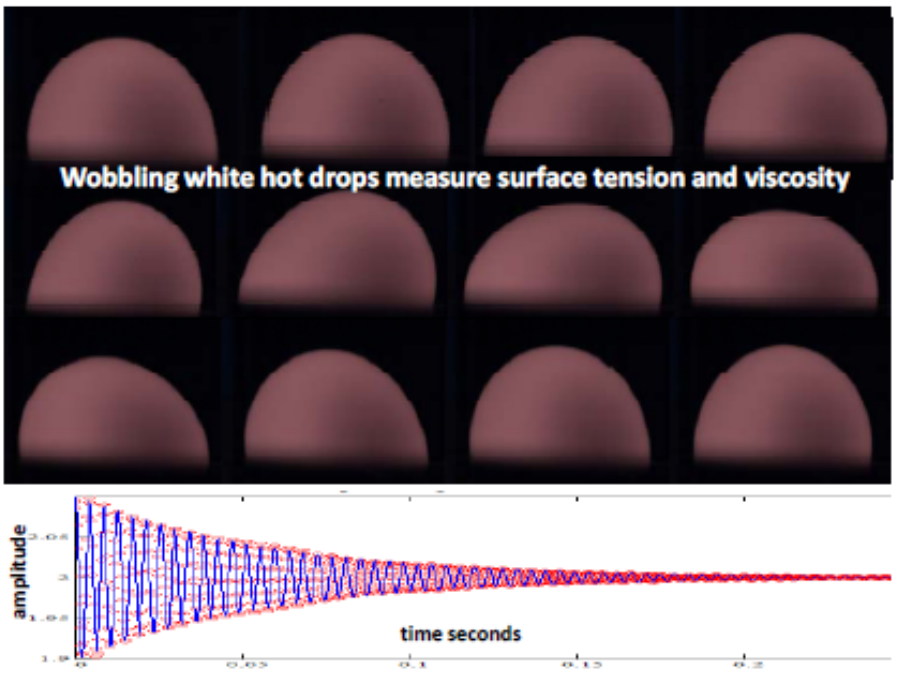


Fig. 1 By oscillating levitated drops enables the surface tension and viscosity to be measured from the resonant frequency and the damping constant respectively. This CAFMaD collaboration includes German Aerospace Koln who are one of only two laboratories in the world advancing this technique. In this case a molten drop of calcium aluminate, an important component in steel making, is shown wobbling close to 200Hz, driven via the levitating gas by acoustic coupling using instrumentation developed in CAFMaD.

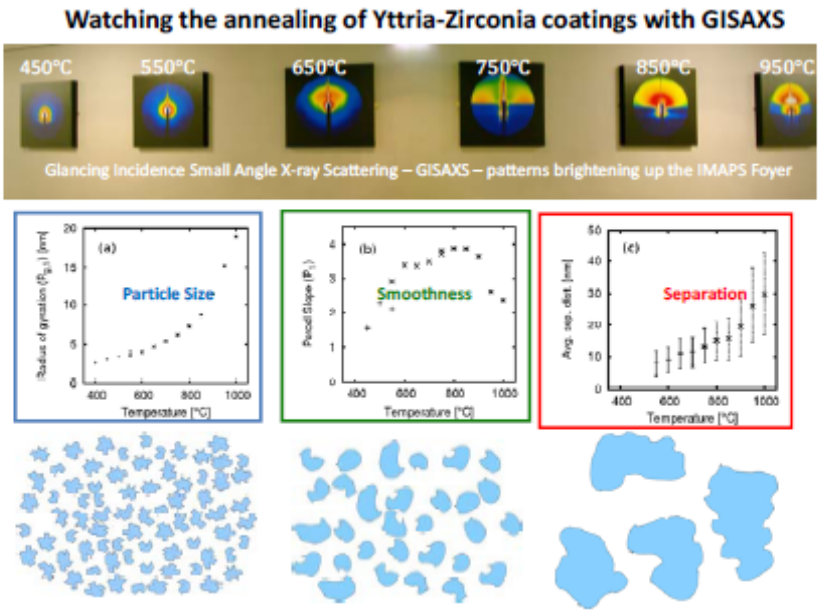


FIG. 2 Yttria stabilised zirconia coatings exhibit good proton and ionic conductivity as well as oxygen transport. The collaboration includes Helmholtz Zentrum in Berlin and the Bulgarian Academy of Sciences. Glancing Incidence Small Angle X-ray Scattering is a newly developed technique at BESSY II and this work beautifully illustrates the capacity for GISAXS to detect particle size, smoothness (or roughness), and density in nanoceramic coatings.

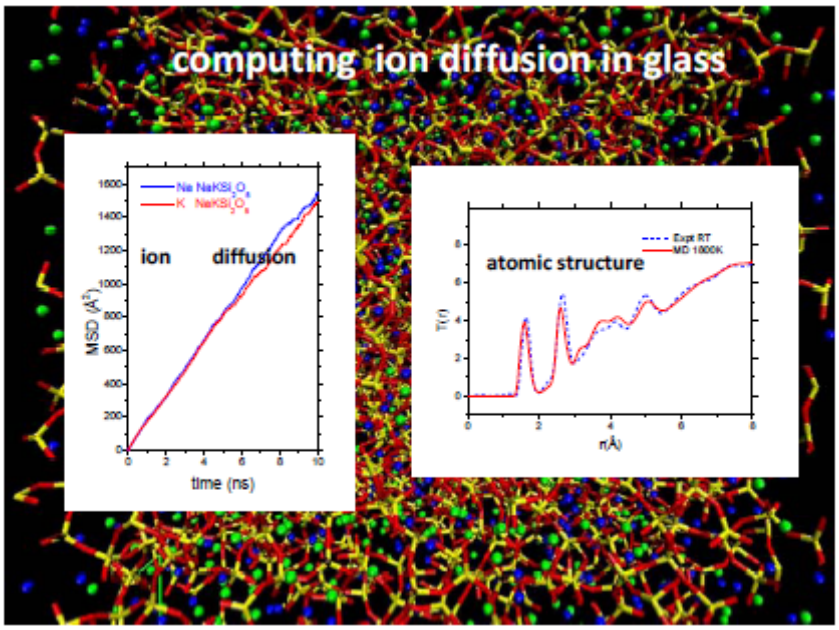


Fig.3 The diffusion of ionic conducting glass and other battery materials can be computed by atomicsimulationoftherandomwalkMeanSquareDisplacementMSD.Largecalculations, like this 8000 atomarray of an alkalisilicate glass, benefit from collaboration between Bangor, Aberystwyth, UCL and Shanghai. In addition to following alkali diffusion for 10 nanoseconds, the atomicstructure extending over an anometreisal so well-reproduced.

Sensors and Devices

Team Leaders: Dr Dave Langstaff

Members:

Imaging Ellipsometer Project

Work continues on the imaging ellipsometer project. Matt gunn and Dave Langstaff completed work on the HEFCW/A4B funded PPOC project to complete the demonstrator instrument and exemplify the patent which has been applied for in relation to the instrument (Figure 1).

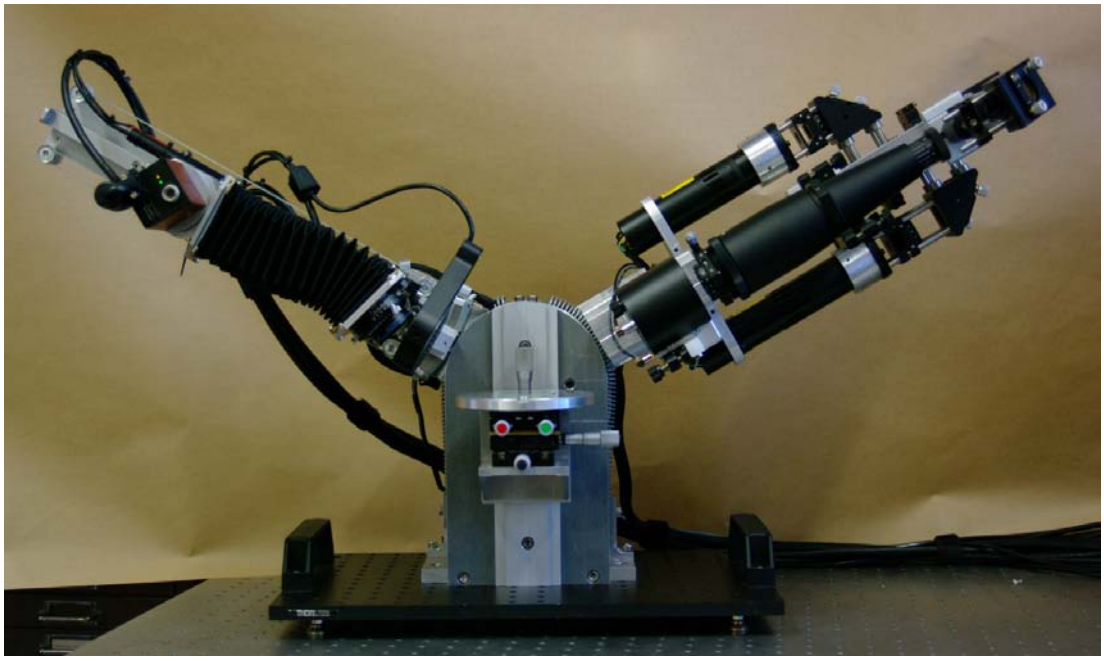


Figure 1: *Imaging Ellipsometer completed as part of PPOC project*

The instrument has been demonstrated to Accurion/Nanofilm Gmbh who are one of Europe's leading manufacturers of ellipsometric instruments.

In parallel with the work on developing the ellipsometric instrument, funding from the University Research Fund has been obtained in order to extend a Leverhulm funded project investigating ellipsometry as a means of monitoring protein – protein interactions. This has used the commercial Sopra instrument and has enabled the progress of these interactions to take be monitored over time. GST protein has been bound to a substrate and a change in the spectrum observed when the appropriate antibody flowed over the substrate (Figure 2).

The spectroscopic instrument was set to repeatedly scan across a small range of the spectrum and the result processed to give an indication of how the protein-protein interaction developed over time (Figure 3).

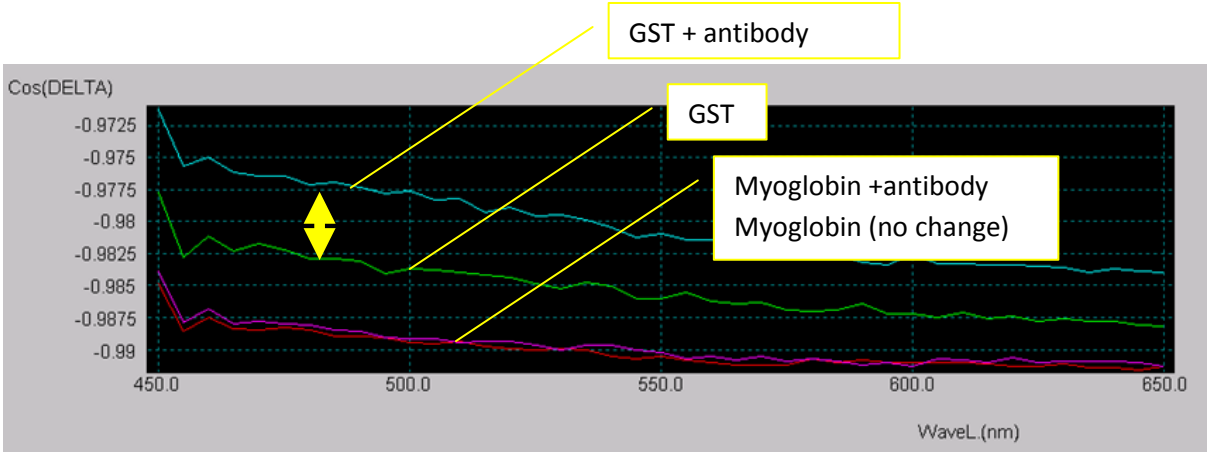


Figure 2: *Specific reaction to GST antibody detected by ellipsometry.*

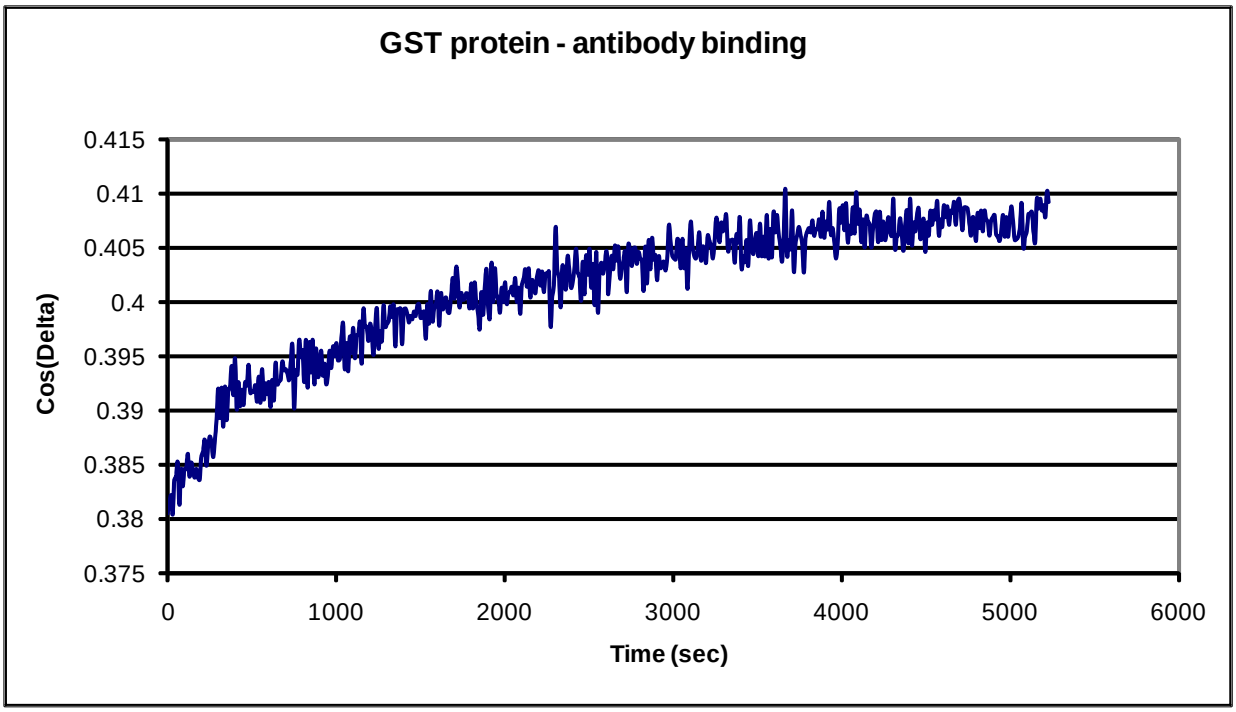


Figure 3*:* *Change in Cos(Delta) at 534nm over time*

The application of ellipsometry to protein – protein interactions is the subject of a grant proposal to BBSRC currently under preparation in conjunction with researchers in IBERS (Aberystwyth).

CalTarg Project

The project to produce a calibration target for the ExoMars project is well underway, with samples of coloured glasses prepared and undergoing characterisation.

Characterisation and Modelling

Team Leaders: Professor Andy Evans; Dr Greg Chass

Members: Dr Simon Cox; Dr Edwin Flikkema; Professor Neville Greaves; Mr Matt Gunn; Dr Florian Kargl; Dr Dave Langstaff; Dr Nigel Poolton; Dr Rudi Winter; Dr Martin Wilding; Dr. Zhongfu Zhou; Dr Peter Holliman; Dr Keith Hughes; Dr Lorrie Murphy; Mr Denis Williams.

Focus Areas:

- X-ray, electron and optical spectroscopy / imaging
- Elastic and inelastic X-ray and neutron scattering
- Muon Spin Resonance for radical species
- Scanned probe microscopy
- Computer simulation and visualisation

A broad swathe of characterisation, measurement and modelling facilities are available through researchers in CAFMaD:

- The standard chemistry techniques of mass spectroscopy, chromatography, X-ray diffraction and Nuclear Magnetic Resonance are complemented with a wide range of optical techniques covering wavelengths from the Infra-red to the Ultra-violet.
- Thin film and device characterisation is catered for using spectroscopy (Raman spectroscopy, ellipsometry, luminescence, photoelectron spectroscopy), microscopy (optical, scanned probe and electron microscopy) and electrical measurements (IV/CV, impedance).
- Nanostructures fabricated in the CAFMaD laboratories are characterised by optical, electron and x-ray methods and by scanned probe techniques (scanning tunnelling microscopy, atomic force microscopy and related techniques (STS, EFM, SCM, I-AFM).
- High-level (DFT, post-HF) '*in-silico*' characterisation and analyses of molecular, amorphous and periodic systems. Accurate geometric and electronic structures determinations complimented by energetic decomposition (enthalpy, entropy, free-energy), wavefunction analyses and spectra-prediction & reproduction.

Many of these facilities have been enhanced and extended by researchers within CAFMaD to offer unique measurement techniques, in particular the in-situ study of processes as they occur. The efficacy of these techniques is demonstrated by the wide scope of molecular, amorphous and periodic systems that have been so-characterised and reported in the literature.

In addition to the in-house facilities, researchers in CAFMaD have considerable expertise in the use of large scale national facilities for the study of materials using such techniques as x-ray and neutron scattering and advanced x-ray techniques.

The measurement and characterisation instrumentation is complemented by extensive computational and modelling facilities. Immersive 3D visualisation permits researchers to combine their knowledge and expertise with experimental results to derive accurate models of the integrated processes taking place within complex materials.

Traditional techniques of characterisation are also complimented by CAFMaD expertise, with highly accurate and precise spectra prediction and reproduction being offered for FTIR, NMR, MS and ESR. Clear and concise model generation and result presentation allow CAFMaD to provide publication-quality visual support to your ongoing research works, particularly where a synergy between experiment and theory is requisite.

Models ranging from a few dozen to hundreds of thousands of atoms are able to be generated, with supporting exploratory analyses.

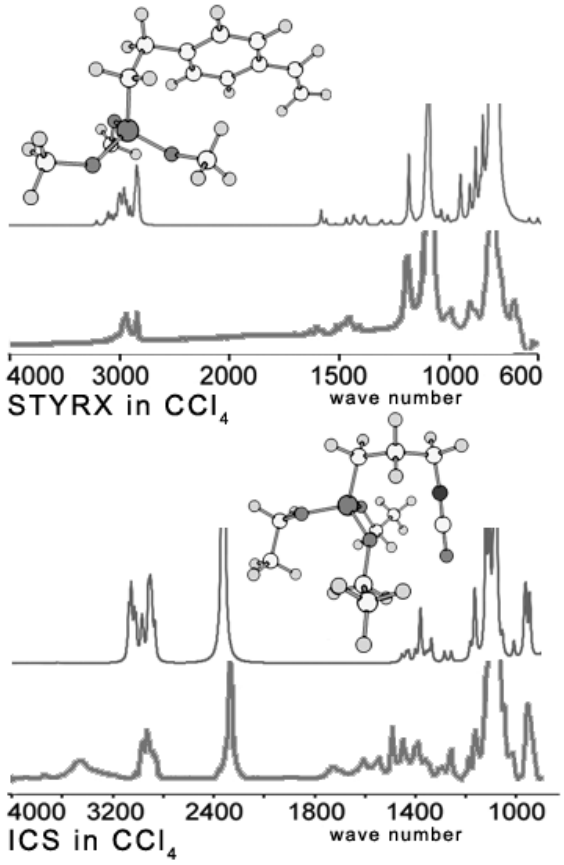


Figure 1: *Bicompatible Adhesive Structure Analyses - Exemplary structure-determination and normal mode peak-assignment for theoretical (thin line) and experimental (thicker line) FTIR spectra of two novel silane adhesives (STYRX and ICS) solvated in CCl_4 show the actual structures prior to surface deposition via hydrolysis.*

In addition to traditional structure and spectra determinations, CAFMaD can provide high-level electronic structure and wavefunction analyses. Quantitative HOMO-LUMO and Fermi level characterisation are generated from the most accurate approximations available. Detailed 2D- and 3D-Laplacian contours of electronic density provide valuable information of molecular reactivities, band gaps, bases of observed mechanical properties and other electronic properties.

Such theoretical methods are cost-effective means of conducting exploratory analyses prior to initiation of empirical works. Knowledge of the geometric and electronic structures can be used to predict spectra, dynamics, electronic and mechanical properties towards effective theory-designed experiments are carried-out.

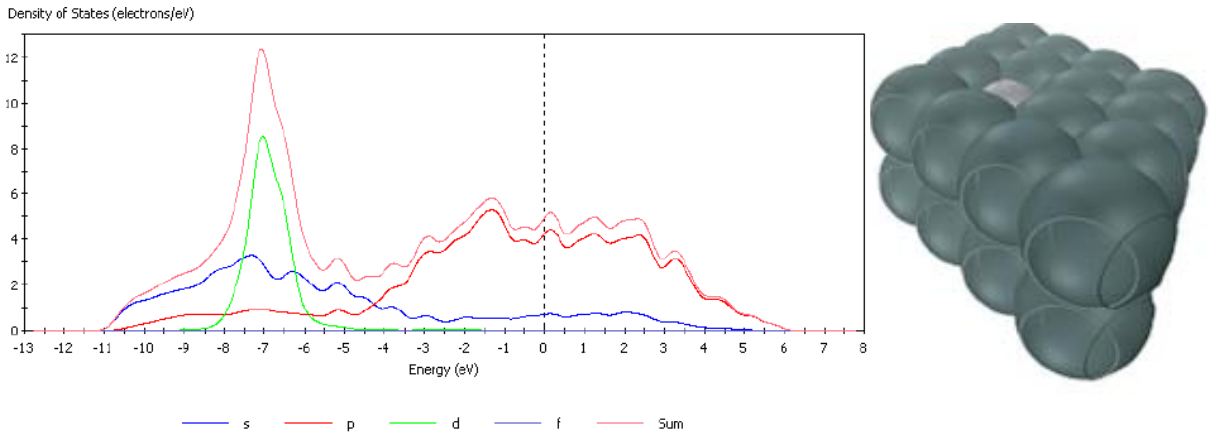


Figure 2: *Partial Density of Electronic States (Left) for a supercell model of the intermetalic Sn_8Hg (Right) showing its constituent orbital angular momentums with respect to the Fermi level (0 eV). Such analyses show orbital-contributions to observed Fermi levels and relative ease of Hg diffusion from the material (from d-orbitals). Results for these models are within 2% of experimentally determined geometric, electronic and mechanical ones.*

Among the experimental characterisation techniques developed within CAFMaD are optical methods that provide spatial variation of both light emission and chemical state. Raman microscopy is enabled using a scanning, focused laser beam in a commercial LabRAM system using 633 nm incident radiation. Luminescence imaging is enabled in a bespoke CCD-based microscope coupled to a vacuum cryostat using a Cu X-ray source or synchrotron radiation. This portable system (CLASSIX – Figure 3) is currently being upgraded in a £300k EPSRC-funded project in collaboration with the Photon Science Institute at Manchester University. Chemical state mapping is possible with this system when coupled to a tuneable x-ray source. As an example of this combined optical and x-ray approach, a variegated brown CVD-grown diamond that shows strong spatial variation in colour (Figure 4) has been studied. The Raman image of Figure 5 has been generated using the relative intensities of the 1332 cm^{-1} phonon line of pure diamond and the 1460 cm^{-1} peak associated with sp^2-bonded carbon. The chemical state map shows the concentration of the latter in the darker regions of the diamond. Luminescence images of the same region (Figure 6) reveal a correlation between dark regions in transmission and low luminescence intensity. X-ray absorption spectra extracted from a series of luminescence images confirm the increased relative abundance of sp^2-bonded carbon in the brown regions.

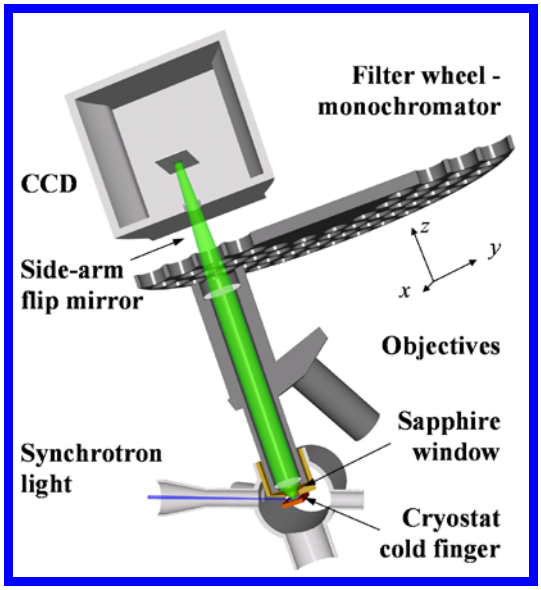


Figure 3: *The CLASSIX luminescence imaging system coupled to a synchrotron source*

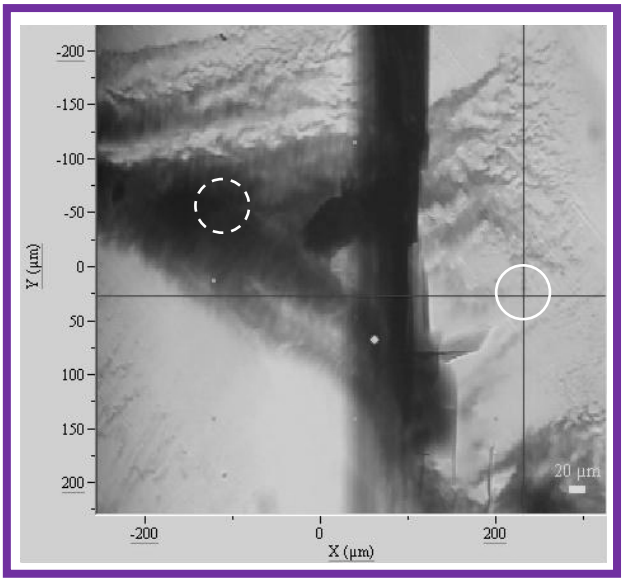


Figure 4: *Optical image of a CVD diamond showing brown regions (broken circle) and transparent regions (closed circle)*

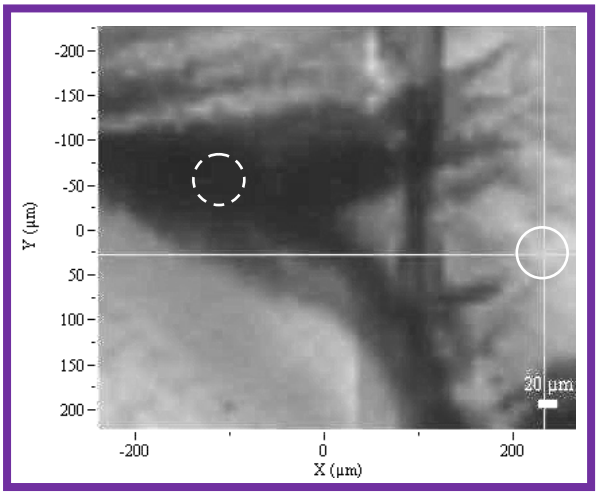


Figure 4: *Chemical phase image generated by the relative intensity of the 1332 cm^{-1} diamond Raman peak intensity (bright) and the 1460 cm^{-1} peak (dark).*

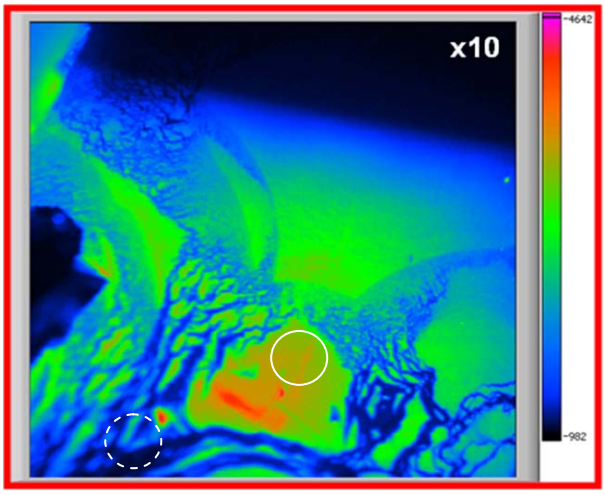


Figure 6: *X-ray excited luminescence image. Absorption spectra for the dark regions show enhanced non-diamond carbon.*

CAFMaD

Publications

2009

CAFMaD Publications 2009

ID	Paper title	CAFMaD Author 1	Other Authors	Journal	Volume	Date	Page Number
97	Effective-mode representation of non-Markovian dynamics: A hierarchical approximation of the spectral density. I. Application to single surface dynamics	K. H. Hughes	C. D. Christ, I. Burghardt	J. Chem. Phys	2	2009	131
102	Closure of quantum hydrodynamic moment equations	K. H. Hughes	S. M. Parry, I. Burghardt	J. Chem. Phys.	130(5)	2009	
104	Quantum Hydrodynamics fo Mixed States	K. H. Hughes	C. D. Christ, I. Burghardt	J. Chem. Phys	131	2009	
105	Non-Markovian reduced dynamics based upon a hierarchial effective-mode representation	K. H. Hughes	I. Burghardt	Chemical Physics		submitted	
109	The Highly Regiospecific Synthesis and Crystal Structure Determination of 1,1'-2,5' Substituted Ring-locked Ferrocenes	P J Holliman	Arthur Connell, Ian R. Butler, Louise Male, Simon J. Coles, Peter N. Horton, Michael B. Hursthouse and William Clegg Luca Russo	J. Organometallic Chemistry	694(13)	2009	2020-2028
110	Studies of interactions of CO2 with biodegradable poly (DL-lactic acid) and poly (lactic acid-co-glycolic acid) copolymers using high pressure ATR-IR and high pressure rheology	Tai, H.	Upton, C.; White, L.; Pini, R.; Storti, G.; Mazzotti, M.; Shakesheff, K.M.; Howdle, S.M	POLYMER		submitted	
111	Photocrosslinked hydrogels from thermoresponsive PEGMEMA-PPGMA-EGDMA copolymers containing multiple methacrylate groups: mechanical property, swelling, protein release and cytotoxicity	Tai, H.	Howard, D. Vermonden, T.; Wang, W.; Hennink, W E.; Howdle, S.M.; Shakesheff, K. M.	BIOMACROMOLECULES		in press	
112	Thermoresponsive and photocrosslinkable PEGMEMA-PPGMA-EGDMA copolymers from one-step ATRP synthesis	Tai, H.	Wang, W.; Vermonden, T., Heath, F.; Hennink, W E., Alexander, C.; Shakesheff, K. M. and Howdle, S. M.	BIOMACROMOLECULES	10	2009	822–828
113	Floating-gate memory based on an organic metal-insulator-semiconductor capacitor	M F Mabrook	S Williamk and D M Taylor	Appl. Phys. Lett.,	95	2009	093309

ID	Paper title	CAFMaD Author 1	Other Authors	Journal	Volume	Date	Page Number
114	The morphology and electrical conductivity of single-wall carbon nanotube thin films prepared by the Langmuir-Blodgett technique	M F Mabrook	C Venet, C Pearson, A S Jomber D A Zeze and M C Petty	Colloids and Surfaces A		2009	
115	A pentacene-based organic thin film memory transistor	M F Mabrook	Y Yun, C Pearson, D A Zeze and M C. Petty	Appl. Phys. Lett.,	94	2009	173302
116	Charge Storage in Pentacene/Polymethylmethacrylate Memory Devices	M F Mabrook	Y Yun, C Pearson, D A Zeze and M C. Petty			2009	
117	The morphology, electrical conductivity and vapour sensing ability of inkjet printed thin films of single-wall carbon nanotubes	M F Mabrook	C Pearson, A S Jombert, D A Zeze and M C Petty	Carbon	47	2009	752-757
140	The scientific rationale for the C1XS X-ray spectrometer on India's Chandrayaan-1 mission to the moon	A C Cook	Crawford, I. A.; Joy, K. H.; Kellett, B. J.; Grande, M.; Wilding, M. et al	Planetary and Space Science	(57) 7	2009	725-734
141	The C1XS X-ray Spectrometer on Chandrayaan-1	A C Cook	Grande, M., Maddison, B. J.; Howe, C. J.; Kellett, B. J.; Sreekumar, P.; Huovelin, J.; Crawford, I.A; Wilding, M.; et al	Planetary and Space Science	57 (7)	2009	717-724
143	Diamond-metal contacts: interface barriers and real-time characterization	D A Evans	Roberts OR, Williams GT, Vearey-Roberts AR, Bain F, Evans S, Langstaff DP, Twitchen DJ	Journal of Physiscs - Condensed Matter	(21) 36	2009	
148	Liquid-liquid transitions, crystallisation and long range fluctuations in supercooled yttrium oxide-aluminium oxide.	G.N. Greaves	Wilding, M C; Fearn, S; Kargl, F; Hennet, L; Bras, W; Majerus, O; Martin, C M.	Journal of Non-Crystalline Solids	355 (10-12)	2009	715-721
158	Li conductivity of nanocrystalline Li4Ti5O12 prepared by a sol-gel method and high-energy ball milling	R Winter	Wojciech Iwaniak, J Fritzsche, M Zukalova, Rudolf Winter, Martin Wilkening, Paul Heitjans	Defect and Diffusion Forum	289-292	2009	565-570
159	In situ Double ASAXS of the Sintering and Calcination of Sol-Gel Prepared Yttria-Stabilised-Zirconia Ceramics	R Winter	Twilight Barnardo, Kristin Hoydalsvik, Chris M. Martin and Graham F. Clark	J Phys Chem C	113 (23)	2009	10021-10028

ID	Paper title	CAFMaD Author 1	Other Authors	Journal	Volume	Date	Page Number
118	Memory effects in MIS structures based on silicon and polymethylmethacrylate with nanoparticle charge-storage elements	M F Mabrook	A S Jombert, D Kolb, D A Zeze and M C Petty	Matt. Sci. Eng. B.	14-17	2009	159-160
120	Azine bridge formation during the electrografting of acrylonitrile	D. M. Taylor	P. A. Easter	J.Poly.Sci.: Polymer Chem.	47	2009	1685-1695
121	Revisiting the Origin of Open Circuit Voltage in nc-TiO_2 /Polymer Heterojunction Solar Cells	D. M. Taylor	H. Al-Dmour	Appl Phys Lett	94	2009	223309
123	Electrical response of highly ordered organic thin film metal-insulator-semiconductor devices	D. M. Taylor	M. Ullah, R. Schwödiauer, H. Sitter, S. Bauer, N. S. Sariciftci and Th. B. Singh,	J. Appl. Phys.	106	2009	114505
124	Tetraphenylboroxinate(1-) salts of monoborate cations: Synthesis and single-crystal X-ray structures of [Ph2B{OCH2CH2NMe(CH2)n}2][Ph4B3O3] (n = 4,5)	M.A. Beckett	E.L. Bennett, P.N. Horton, and M.B. Hursthouse, J. Organonmet	Chem.		in press	
126	Catalytic coupling: Wittig without waste Nature Chemistry	Gregory A. Chass	C. J. O'Brien, J. L. Tellez, Z. S. Nixon, L. J. Kang, K. C. Przeworski,			2009	
127	Recycling Wittig Waste: A cyclic catalyst precursor facilitates reuse of the by-product in an olefination reaction	Gregory A. Chass	C. J. O'Brien, J. L. Tellez, Z. S. Nixon, L. J. Kang, K. C. Przeworski,	Chemical & Engineering News	37	2009	
128	Recycling the Waste: The Development of a Catalytic Wittig Reaction	Gregory A. Chass	C. J. O'Brien, J. L. Tellez, Z. S. Nixon, L. J. Kang, K. C. Przeworski,	Angew. Chem. Int. Ed.	48	2009	6836-6839
129	Systemic energy management by strategically located functional components within molecular frameworks, determined by systems chemistry	Gregory A. Chass	Zoltán Mucsi and Imre G. Csizmadia	J. Phys. Chem. B.	113	2009	
130	Network of Hydrogen bonds in Pro-Ala-Pro and Pro-Phe-Pro Diamides A First Principle Study of Ala → Phe Point Mutation in Proline Environment	Gregory A. Chass	Hui Wang, Imre G. Csizmadia, Istvan Marsi, DeCai. Fang and Bela Viskolcz	J. Chem. Phys.	131	2009	

ID	Paper title	CAFMaD Author 1	Other Authors	Journal	Volume	Date	Page Number
131	A quantitative scale for the extent of conjugation of substituted olefins. Olefinicity percentage as a chemical driving force	Gregory A. Chass	Zoltán Mucsi and Imre G. Csizmadia	J. Phys. Chem. A.	113	2009	7953-7962
133	Synchronization of Chaos in Unidirectionally and Bidirectionally Coupled Multiple Time Delay Laser Diodes with Electro-Optical Feedback	K. A. Shore	E.M.SHAHVERDIEV	Optics. Comms.	282	2009	210-216
134	Impact of modulated multiple optical feedback time delays on laser diode chaos synchronization	K. A. Shore	E.M.SHAHVERDIEV	Optics. Comms.	282	2009	3568-3572
135	Cascaded and adaptive chaos synchronization in multiple time delay laser systems	K. A. Shore	E.M.SHAHVERDIEV and P.A.BAYRAMOV	Chaos Solitons and Fractals	42	2009	180-186
136	Generalised synchronisation in laser devices with electro-optical feedback	K. A. Shore	E.M.SHAHVERDIEV	IET Proc Optoelectronics	3	2009	274-282
137	Erasure of time delay signatures in the output of an optoelectronic feedback laser with modulated delays and chaos synchronization	K. A. Shore	E.M.SHAHVERDIEV	IET Proc Optoelectronics	3	2009	326-330
138	Multi-interface roughness effects on electron mobility in Ga0.5In 0.5GaAs multisub-band coupled quantum well structures	K. A. Shore	T. SAHU	Semiconductor Science and Technology	24	2009	095021 (7pp)
139	GHz Bandwidth Message Transmission Using Chaotic Vertical-Cavity Surface-Emitting Lasers	K. A. Shore	Y.,LEE, M.W. PAUL. J., SPENCER, P.S.	IEEE J. Lightwave Tech.	22	2009	5099-5105
57	Efficient model chemistries for peptides. II. Basis set convergence in the B3LYP method	Gregory A. Chass	Pablo Echenique	Phil. Nat.	1(1)	2009	1-18
60	A Prelude to Design Biofriendly Nanostructural Arms using Biological Hinges as Models. First Principle Conformational Analysis on the Ala-Phe Point Mutation in Proline Environment,	Gregory A. Chass	Hui Wang, Zoltan Mucsi, Imre G. Csizmadia, De C. Fang, Bela Viskolcz	Phil. Nat.	1(1)	2009	77-98

ID	Paper title	CAFMaD Author 1	Other Authors	Journal	Volume	Date	Page Number
78	Structural, Optical and Electrical Properties of Co-evaporated CuCl/KCl films	D.M. Taylor	F. O. Lucas, P.J. McNally, A. Cowley, S. Daniels, L. Bradley, D. Danieluk	Phys. Stat. Solid-C		in press	
81	Density Functional Theory (DFT) Investigation of the Alkyl-Alkyl Negishi Cross-Coupling Reaction Catalyzed by N-heterocyclic Carbene (NHC)-Pd Complexes	Gregory A. Chass	Christopher J. O'Brien, Eric Assen B. Kantchev, Wei-Hua Mu, De-Cai Fang, Alan C. Hopkinson, Imre G. Csizmadia, Michael G. Organ	Chem. Eur. J.		2009	
82	Charge Storage in Pentacene/Polymethylmethacrylate Memory Devices	M. F. Mabrook	Y. Yun, C. Pearson, D. A. Zeze, M.C. Petty	IEEE Electron Device Letters		in press	
83	The morphology, electrical conductivity and vapour sensing ability of inkjet printed thin films of single-wall carbon nanotubes	M. F. Mabrook	C. Pearson, A. S. Jombert, D. A. Zeze, and M. C. Petty	Carbon	47 (3)	2009	752-757
84	Memory effects in MIS structures based on silicon and polymethylmethacrylate with nanoparticle charge-storage elements	M. F. Mabrook	A. S. Jombert, D. Kolb, D. A. Zeze, and M. C. Petty	Matt. Sci. Eng. B.		in press	
87	Electrical behaviour of memory devices based on fluoren-containing organic thin films	M. F. Mabrook	P Dimitrakis, P Normand, D Tsoukalas, C Pearson, J H Ahn, D A Zeze, M C Petty, K T Kamtekar, C Wang, M R Bryce and M Green	J. Appl. Phys		in press	
92	High pressure effects on liquid viscosity and glass transition behaviour, polyamorphic phase transitions and structural properties of glasses and liquids	M Wilding	McMillan, P. F.	Journal of non-crystalline solids		in press	

CAFMaD

Grant Capture Data

2009

CAFMAD Grant Capture Report - 2009

ID	Project Title	Status	Principal Investigator 1	PI 1 Aber or Bangor?	Prinicpal Investigator 2	PI 2 Aber or bangor?	Joint AU/BU Project	Investigator funded by Partnership	CAFMaD core activity	Funder	Total Value to Partnership	Comments
511	Vibrational spectrospcopy of novel N-heterocyclic Pd-catalysts	Award	Greg Chass	Bangor	Florian Kargl	Aberystwyth	☑	☑	☑	ISIS, ILL Consumables Grant	£1,656.00	Characterisation and Modelling value tbc
522	Liquid Crystal Optics for Imaging Ellipsometry in collaboration with Laser Physics UK Ltd	Award	Tudor Jenkins	Aberystwyth	Matt Gunn	Aberystwyth	☐	☑	☑	IPMKTN/IEM RC	£5,000.00	Sensors and Devices
519	Alkyl-group dynamics as a basis for differing Pd-NHC catalytic efficiencies	Award	Greg Chass	Bangor	Florian Kargl	Aberystwyth	☑	☑	☑	ILL (Grenoble)	£121,000.00	Characterisation and Modelling
518	Structural Properties and dynamics of chalcogenides	Award	Florian Kargl	Aberystwyth			☐	☑	☑	ISIS, ILL consumables grant	£919.00	Extreme Materials
517	Structural Properties and dynamics of chalcogenides	Award	Florian Kargl	Aberystwyth			☐	☑	☑	ISIS	£44,000.00	Extreme Materials
516	Structure Dynamics and magnetic propoerties of levitated liquids	Award	Louis Hennet	CNRS-CEMHTI			☐	☑	☑	ILL PhD studentship	£0.00	Extreme Materials value tbc
515	Developing a laser heated aerodynamic levitator for time of flight spectroscopy	Award	Florian Kargl	Aberystwyth			☐	☑	☑	FRM-II Munich	£11,000.00	Extreme Materials
514	Following freezing melting and demsity inhomogeneities in CaAl204 employing SAXS/WAXS using aerodynamic levitation	Award	Florian Kargl	Aberystwyth			☑	☑	☑	Diamond Facility	£49,000.00	Extreme Materials
660	Lonsdaleite from meteors	Award	Andrew Evans	Aberystwyth			☐	☑	☐	STFC	£25,000.00	

ID	Project Title	Status	Principal Investigator 1	PI 1 Aber or Bangor?	Prinicpal Investigator 2	PI 2 Aber or bangor?	Joint AU/BU Project	Investigator funded by Partnership	CAFMaD core activity	Funder	Total Value to Partnership	Comments
512	Slow dynamics in undercooled lead investigated on OSIRIS using a levitation furnace.	Award	Franz Demmel	ISIS			☐	☑	☑	ISIS Facility	£77,000.00	Extreme Materials
659	A1 diamond interfaces studied using XPEEM	Award	Andrew Evans	Aberystwyth			☐	☑	☐	STFC	£25,000.00	
510	Vibrational spectrospcopy of novel N-heterocyclic Pd-catalysts	Award	Greg Chass	Bangor	Florian Kargl	Aberystwyth	☑	☑	☑	ISIS Facility	£44,000.00	Characterisation and Modelling
509	Characterisation of weakly polar interactions from dynamics of N- and C-protected Phe- and Pro-containing dipeptides	Award	Greg Chass	Bangor	Florian Kargl	Aberystwyth	☑	☑	☑	ISIS, ILL Consumables Grant	£860.00	Characterisation and Modelling value tbc
508	Characterisation of weakly polar interactions from dynamics of N- and C-protected Phe- and Pro-containing dipeptides	Award	Greg Chass	Bangor	Florian Kargl	Aberystwyth	☑	☑	☑	ILL (Grenoble)	£77,000.00	Characterisation and Modelling
507	Methyl group librational dynamics in NHC catalysts at low temperature	Award	Greg Chass	Bangor	Florian Kargl	Aberystwyth	☑	☑	☑	ILL (Grenoble)	£224,000.00	Characterisation and Modelling
506	Alkyll-group dynamics as a basis for differing Pd-NHC catalyst efficiencies	Award	Greg Chass	Bangor	Florian Kargl	Aberystwyth	☑	☑	☑	ISS,ILL Consumables Grant	£818.00	Characterisation and Modelling
505	Laser Heated aerodynamic levitation to measure surface tension and viscosity using oscillating sphere methodology	Award	Florian Kargl	Aberystwyth			☐	☑	☑	College Research Fund	£998.00	Extreme Materials
470	EUROPEAN MATERIALS RESEARCH SOCIETY	Award	Edwin Flikkema	Aberystwyth			☐	☐	☑	Royal Society	£1,080.00	

ID	Project Title	Status	Principal Investigator 1	PI 1 Aber or Bangor?	Prinicpal Investigator 2	PI 2 Aber or bangor?	Joint AU/BU Project	Investigator funded by Partnership	CAFMaD core activity	Funder	Total Value to Partnership	Comments
513	Measuring Average mean-square-displacements through the amorphisation transition	Award	Florian Kargl	Aberystwyth			☐	☑	☑	ISIS Facility	£22,000.00	Extreme Materials
627	PHOTOELECTRON SPECTROSCOPY AND MICROSCOPY USING SYNCHROTRON RADIATION FOR EXPLOITING DIAMOND SURFACES AND INTERFACES	Award	Andy Evans	Aberystwyth			☐	☑	☑	EPSRC	£152,951.00	
633	PROVISCOUT PLANETARY ROBOTICS VISION SCOUT	Award	David Barnes	Aberystwyth			☐	☐	☑	European Commission FP7	£176,772.00	
630	Mars Surface Sampler Transfer and Manipulation	Award	David Barnes	Aberystwyth			☐	☐	☑	Astrium Ltd	£8,982.00	
521	Imaging Ellipsometer	Award	Tudor Jenkins	Aberystwyth	Matt Gunn	Aberystwyth	☐	☑	☑	WAG / A4B	£49,353.00	Sensors and Devices
628	INYS ADVANCED MATERIALS AND DEVICES EVENT - SINGAPORE	Award	Neville Greaves	Aberystwyth			☐	☐	☑	BRITISH COUNCIL	£10,000.00	
605	Towards a series of design rules for Homogenous catalysis: synergy begween	Award	Greg Chass	Bangor			☐	☑	☐	EPSRC	£99,972.00	added from BU database
603	A diamond anvil cell for high energy X-ray diffraction studies	Award	Martin Wilding	Aberystwyth			☐	☐	☐	Royal Society	£14,555.00	
582	New Fabrication Method for Molecular Electronic Devices	Award	Justin Lawrence	Bangor			☐	☑	☐	Nuffield Foundation	£1,440.00	added from BU database
629	Glass and Entropy Workshop	Award	Martin Wilding	Aberystwyth			☐	☐	☑	Laboratoire Des Colloides	£17,380.00	

ID	Project Title	Status	Principal Investigator 1	PI 1 Aber or Bangor?	Prinicpal Investigator 2	PI 2 Aber or bangor?	Joint AU/BU Project	Investigator funded by Partnership	CAFMaD core activity	Funder	Total Value to Partnership	Comments
586	International Conference on Materials for Advanced Technologies	Award	David Taylor	Bangor			☐	☑	☐	Royal Society	£1,591.00	added from BU database
602	High Perfromance OLEDs	Pre-Proposal	David Taylor	Bangor			☐	☑	☐	LOMOX	£282,707.00	added from BU database
631	AMERICAN PHYSICAL SOCIETY MARCH 2009, PITTSBURGH USA	Proposal	Edwin Flikkema	Aberystwyth			☐	☐	☑	Royal Society	£1,757.00	
442	Inert Enviornment Fabication and Chracterisation Facility	Proposal	Martin Taylor	Bangor			☐	☑	☑	WAG	£200,003.00	
634	Transfer and Application of Autonomous Systems knowledge and Techniques from the ESA Exomars Rover R+D programme to Research on a Concept UTOL UAV	Proposal	David Barnes	Aberystwyth			☐	☐	☐	STFC	£63,099.00	
632	6th International Discussion Meeting on Relaxations in Complex Systems	Proposal	Neville Greaves	Aberystwyth			☐	☑	☑	Royal Society	£1,143.00	
439	Patterning and Self Assembly for Organic Thin Film Lasers	Proposal	Justin Lawrence	Bangor			☐	☑	☑	EPSRC	£329,235.00	
606	Single molecule electronic devices	Proposal	Geoff Ashwell	Bangor	Andy Evans	Aberystwyth	☑	☑	☐	IEMRC EPSRC	£250,000.00	total project value £393591
589	Photodegradation of antibiotics in waste water	Rejected	Peter Holliman	Bangor			☐	☐	☐	European Commission	£144,389.00	added from BU database

ID	Project Title	Status	Principal Investigator 1	PI 1 Aber or Bangor?	Prinicpal Investigator 2	PI 2 Aber or bangor?	Joint AU/BU Project	Investigator funded by Partnership	CAFMaD core activity	Funder	Total Value to Partnership	Comments
579	Nano-sized molecular stacks with I-V characteristics that mimic those of bulk inorganic pn junctions	Rejected	Geoff Ashwell	Bangor			☐	☑	☐	EPSRC	£358,414.00	added from BU database
587	Formation of cost-effective synergy between experiment and theory via 'benchmarking	Rejected	Gregory Chass	Bangor			☐	☑	☐	Royal Society	£15,000.00	added from BU database
772	Sustainable Optoelectronics Systems (SOS)	Rejected	K A Shore	Bangor			☐	☐	☐	European Commission	£0.00	
447	Dip-pen Lithography as a Tool for Fabricating Molecular Electronic Devices	Rejected	Justin Lawrence	Bangor			☐	☑	☑	Royal Society	£4,000.00	
445	Polymeric Resistive RAMS: Elicidating the Switching Mechanism	Rejected	Martin Taylor	Bangor	Andy Evans	Aberystwyth	☑	☑	☑	EPSRC	£543,224.00	
443	Nanostructures - HiMAT	Rejected	Maher Kalaji	Bangor			☐	☐	☑	European Commission	£439,786.00	
588	Energy, Catalysis, Computing and Sustainability on the North-South Axis of China	Rejected	John Farrar	Bangor			☐	☐	☐	EPSRC	£784,983.00	added from BU database
773	Turn-key Excitation of Nano-mechanical Optical Resonances (TENOR)	Rejected	K A Shore	Bangor			☐	☐	☐	Royal Society	£0.00	

CAFMaD

CAFMaD Flyer and list of core members research interests 2009

CAFMaD

PRIFYSGOL ABERYSTWYTH UNIVERSITY

PRIFYSGOL BANGOR UNIVERSITY

Prifysgol Aberystwyth a Phrifysgol Bangor

Aberystwyth University and Bangor University

Centre for Advanced Functional Materials and Devices
www.cafmad.ac.uk

The £2.9M Centre for Advanced Functional Materials and Devices (CAFMaD) is part of the Aberystwyth University and Bangor University Research & Enterprise Partnership. The Partnership was awarded HEFCW funding of £10.9M from 2007 to 2011 to provide research and entrepreneurship support across the Universities and to create four internationally recognised research Centres:

- Centre for Advanced Functional Materials and Devices (CAFMaD)
- Centre for Integrated Research in the Rural Environment (CIRRE)
- Centre for Catchment and Coastal Research (CCCR)
- Institute for Medieval and Early Modern Studies (IMEMS)

CAFMaD brings together leading academics from the Institute of Mathematics and Physics (IMAPS) and the Welsh Visualisation Centre at Aberystwyth University, and the College of Physical and Applied Sciences at Bangor University, which includes the School of Chemistry, the School of Electronic Engineering and the School of Computer Science.

CAFMaD's strengths are in materials, sensors, mathematics, space physics, synthesis and catalysis, molecular modelling, visualisation, image recognition, characterisation, photovoltaics, biological chemistry, optoelectronics and high performance computing.

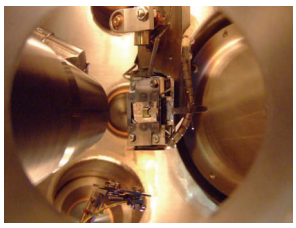
Aberystwyth leads in glasses and ceramics, semiconductor surfaces and interfaces, advanced characterisation techniques and stereo reconstruction and modelling of solids and surfaces. Bangor leads developments in optoelectronics and solar cell technology, materials synthesis and catalysis, polymer processing, polymer electronics, micro-nano-fabrication and molecular modelling.

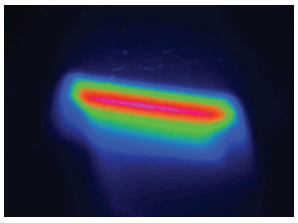
CAFMaD's Vision

To be an international centre of excellence for the development, characterisation and application of advanced materials and devices.

CAFMaD's Mission

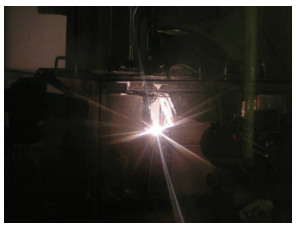
To be an international centre of research excellence, which is based on pure science and capable of delivering sustainable economic growth in Wales, the UK and beyond.

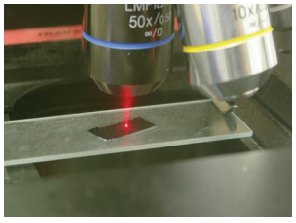




Research Facilities and Equipment available at CAFMaD include:

- Sopra Spectroscopic Ellipsometer
- JY Raman spectrometer (high resolution)
- The X-ray Diffractometer (with fast position sensitive detector)
- The REES XPS kit with bespoke detector enabling real time measurements
- CLASSIX luminescence kit (unique and soon to be upgraded)
- Laser heated aerodynamic levitation furnace
- Bespoke imaging ellipsometer under development
- Bruker microTOF mass spectrometer
- Waters GCT TOF mass spectrometer
- Philips X-PERT pro XRD
- HPC and visualisation facilities
- Nano-arrayer
- Surface probe microscopy
- Polymer electronic device prototyping
- Surface analysis
- Electrical characterisation

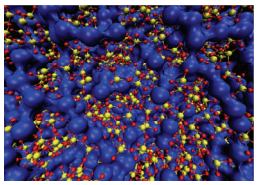




Research Streams

CAFMaD is a Research Centre that has its values embedded in pure science and seeks to increase funding in this area, but also embraces commercialisation opportunities by developing links with other universities, industry, government and third mission organisations.

1. Organic Electronics, which includes:

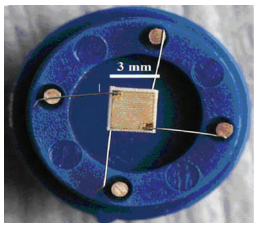


- Polymer Electronics
- Organic Lasers
- Contact Formation
- Nanolithography
- Molecular Wires and Diodes
- Sustainable Energy

2. Extreme Materials, which includes:

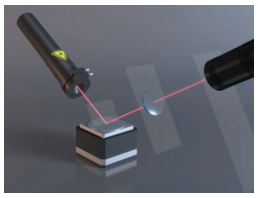
- Fast Ion Diffusion
- Glasses at HT and HP
- Melting and Amorphisation
- Nanoceramics and sintering
- Radiation-hard Semiconductors
- Planetary Exploration

3. Sensors and Devices, which includes:



- Semiconductor Solar Cells
- Charge Detectors for Electrons and Ions
- Smart end-station for combined electron and light spectroscopies

4. Characterisation & Modelling, which includes:



- Real Time Photoemission
- Optical Luminescence
- Elastic and Inelastic X-ray and Neutron scattering
- X-ray and Optical Imaging
- Computer simulation and visualisation
- Bio Materials and Polymers

CAFMaD Members

CAFMaD is led by a Management Group, which is currently steered by Professor Neville Greaves at Aberystwyth University and Professor Geoff Ashwell at Bangor University. As well as many academic members researching in the CAFMaD research streams, there are a number of directly funded Chairs and Researchers; their contact details are below. For information about their research interests and the wider CAFMaD community, please visit www.cafmad.ac.uk. If you wish to contact to someone about CAFMaD, please contact Gary Reed, Partnership Development Manager on +44 (0)1970 62 1789 or gar@aber.ac.uk

Dr Tony Cook	atc@aber.ac.uk	Change detection on the Moon's surface: impact flashes and transient lunar phenomena, automated digital planetary cartgraphy, and robotic telescopes
Dr Greg Chass	g.chass@bangor.ac.uk	Formulation of effective computational methods including the design and construction of PC-Unix clusters and 'smart' data-sets for scientific computations
Prof Andrew Evans	a.evans@aber.ac.uk	Semiconductor physics, in particular using carbon-based materials (organic molecules and diamond)
Prof Neville Greaves	gng@aber.ac.uk	Materials Physics: Glass structure and glass properties: semiconductors: Syncotron Radiation and Neutron Techniques and applications.
Mr Matthew Gunn	mmg@aber.ac.uk	Optical measuring techniques and related instrumentation systems. Developing sampling environments in low and high temperatures and from vacuums to underwater.
Dr Florian Kargl	ffk@aber.ac.uk	Relationship between microscopic dynamics and structure.
Dr David Langstaff	dpl@aber.ac.uk	The design, implementation and application of advanced detectors for electron spectroscopy applications
Dr Mohamed Mabrook	m.f.mabrook@bangor.ac.uk	Plastic Technology: Organic Transistors, Memory Devices, Sensors and organic Solar Cells
Dr Hongyun Tai	h.tai@bangor.ac.uk	Functional polymers for tissue engineering and drug delivery applications
Prof Martin Taylor	d.m.taylor@bangor.ac.uk	Electrical properties of thin films including insulating polymers, silicon dioxide, Langmuir-Blodgett films and semi conducting polymers: organic electronics
Mr Denis Williams	d.j.williams@bangor.ac.uk	Chief Technician, School of Chemistry, Bangor University
Dr Zhongfu Zhou	zzz@aber.ac.uk	Material simulation and design, electron/X-ray diffraction and scattering, structural studies of crystals and defects.