

BCA IG Newsletter

August 2007

Notes from the Chair

This is the first IG Newsletter since I became Chair of the IG Committee, and I'd like to contribute a few thoughts. Many thanks go to the outgoing Chair, Jeremy Karl Cockroft, for his sterling contribution to the IG over the years, both as an officer on the committee and as an active committee member. We're all grateful that Jeremy has continued his involvement with the IG committee, as one of the organisers of our Small Angle Scattering Meeting (more below).

So far in 2007 we have organised two sets of meetings, and have two more meetings planned for the Autumn. At the BCA Spring meeting we had an IG strand of lectures, as usual, and in a break from tradition (and, I hope, the start of a new one), we gave prizes for the best contributed talks at the Young Crystallographers Satellite Meeting. I had the pleasure of being one of the judges at this event, along with Roy Copley & Martin Gill; we were all struck by the high quality of the presentations and the breadth and depth of the topics covered. It was a great way of

Forthcoming Events 2007/2008

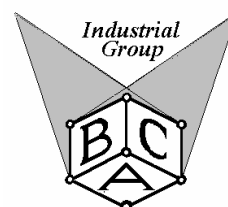
- 7th November 2007 **Pharmaceutical Special Interest Group** AstraZeneca
- 8th November 2007 **Autumn Meeting** AstraZeneca
- 8th to 10th April **BCA Spring Meeting** University of York
- 14th May 2008 **Joint BCA/RSC XRF Meeting**
- 15th May 2008 **XRD and Minerals** British Geological Survey

See the Industrial Group's web site for more details of these meetings.

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Charity Registration Number: 284718

World Wide Web addresses:

BCA <http://www.crystallography.org.uk>

IG <http://bca.cryst.bbk.ac.uk/bca/ig/ig.htm>

Tip Google BCA IG (with a space) to find us!



Thanks to **SPeXCertiPrep Ltd** for sponsoring the cost of production and distribution of this edition of the Industrial Group Newsletter.

<http://www.spexcertiprep.co.uk/sampleprep/>

getting an overview of crystallography-oriented research in the U.K.

In July, the IG held a meeting on Small Angle Scattering at the ILL in Grenoble; our first-ever overseas meeting. I'd like to thank the speakers, delegates and organisers (David Taylor, Richard Morris and Jeremy Cockcroft from the IG committee and the local organising secretary, Karine Sultan of ILL) for their participation in this meeting.

Later this year we have a Pharmaceutical SIG and the regular Autumn Industrial Group meeting, and these will take place on consecutive days at AstraZeneca in Macclesfield. We are still open to offers of talks for the general Industrial day, so please contact Judith Shackleton if you would like to contribute. We have filled the Pharma program, it promises to be a great day, and details of all these meetings can be found later in this Newsletter.

I hope to see many of you later in the year, in Macclesfield.

Anne Kavanagh
AstraZeneca

Industrial Group E-mail Mailing lists – Online registration.

We now maintain separate lists for XRF and XRD mailings so please register for BOTH if you want to be kept totally in the picture. The IG sends about six E-mail notices each year to anyone interested (You don't even need to be a BCA member!). These inform of Newsletter postings and the various meetings we organise each year. You can now register for our E-mail lists online - follow the link from the IG home page. There is an opportunity to be removed from the list with each mailing.

EDITORIAL

Welcome to this edition of the BCA Industrial Group's Newsletter. As you'll see it is crammed with reports for the sessions which the Industrial Group organised at this year's BCA Spring Meeting held at the University of Canterbury. Thank you to the members who took the time to write up these reports.

I would like to remind you that unedited versions of all the reports covered in this Newsletter can be found on the group's web site

<http://bca.cryst.bbk.ac.uk/bca/ig/ig.htm>

Also included is a report for the Small Angle Scattering Special Interest Group Meeting which was held at the ILL, Grenoble in July. The Group can be rightfully proud of what was achieved here – it was our first meeting on 'foreign' soil! Let's hope this isn't our last.

The British Society for Strain Measurement and the Industrial Group jointly organised a Residual Stress Meeting at the University of Manchester on the 14th Feb 2007. See the Industrial Group's web site for a full report.

Take a look at the upcoming meetings on page 10. Please support the group by attending these meetings and, even better, volunteering to help would be much appreciated.

Newsletter and Web Site Content

We continually try to improve the content of both the Newsletter and web pages and would like to ask you to submit articles etc. Do you use web sites for your day to day work in XRD and XRF? If yes, then which sites do you visit, let us know and send us a paragraph about what you use the site for and why you like it.

That's it for now. Enjoy your Newsletter.

Mark Farnworth – Pilkington Group Limited
Editor

2007 Spring Meeting University of Canterbury 17-19 April 2007 Industrial Group - XRD Report

Co-crystals of Pharmaceutical Materials - 17th April 2007



Speakers - Left to Right: Chris Frampton, Bill Jones, Keith Chadwick, Anne Kavanagh (Co-Chair), Roy Copley (Co-Chair)

The first talk in this well attended session, chaired by Anne Kavanagh and Roy Copley, was given by **Bill Jones** (Cambridge). His informative presentation on "Strategies for Designing and Making Cococrystals" started by describing a cococrystal as being made up of two or more non-ionized molecular species that are connected by non-covalent interactions. One potential use of cococrystals was illustrated by considering the moisture stability of cococrystals, with a cococrystal of caffeine being far more resistant to hydration than anhydrous caffeine itself. The talk then proceeded to look at the formation of cococrystals and the differences between solution and mechanical methods. Again using examples of caffeine with different formers, it was shown that the two techniques could yield either the same cococrystal product, different polymorphs of the same product or even different cococrystal stoichiometries.

The next speaker was **Keith Chadwick** (Manchester) whose comprehensive and well illustrated presentation was entitled, "Nucleation and Phase Relationships for a Cococrystal". The talk described a detailed study on benzophenone (BZP) and diphenylamine (DPA) that form a cococrystal with a 1:1 stoichiometry. In 1933 the binary

phase diagram of BZP and DPA was constructed and it showed it was possible to form two polymorphs of the cococrystal from the melt. Form I has a known crystal structure and form II is metastable. The two forms can be prepared from an equimolar melt, although the only way to obtain form II is to crash cool to 253K. Conversion from form II to form I can be monitored using powder diffraction. Raman microscopy suggests the presence of hydrogen bonded dimers in form II (as in form I) and a conformation of the individual BZP and DPA molecules similar to those in the crystal structures of the individual components.

Chris Frampton (Pharmorphix) gave the final talk, "Pharmaceutical Cococrystals: Panic to Panacea" which gave a valuable overview of the benefits and possible pitfalls of the pharmaceutical development of cococrystals. After a range of definitions of a cococrystal, it was suggested that the primary industrial driver was improving solid-state properties and that cococrystallisation was just one of the options open to achieve this. After citing a number of recent examples, it was explained that cococrystallisation can lead to improvements in numerous properties, such as morphology, apparent solubility, dissolution rate, chemical and mechanical stability, bulk density and hygroscopicity.

The presentation then addressed the issue of sample preparation and the advantages of grinding and solvent-assisted grinding were again commented upon. The benefits of slurring to produce cococrystals of caffeine with barbital, tartaric acid and succinic acid were outlined. Early results of grinding and slurring experiments of dipyrindamole with aspirin were followed by a final comment on the topic of intellectual property, where it was noted that novel cococrystal forms can be patented in the same way as other solid forms if advantageous properties arise.

Roy Copley

2007 Spring Meeting University of Canterbury 17-19 April 2007 Industrial Group - XRD Reports

Detailed reports can be found at <http://bca.cryst.bbk.ac.uk/bca/ig/ig.htm>

XRF/XRD joint session on thin films – 18th April 2007



Speakers - Left to Right: Chris Staddon (Co-Chair) Brian Tanner, Heiko Ress, Joachim Woitok, Tom Ryan, Dave Taylor (Co-Chair)

Thin Films and Coatings by XRF and XRD: an overview

Tom Ryan (Nanometrics, Oregon, USA)

Tom began by saying XRD, XRF and XRR are universally acknowledged to be more direct and less model-dependant than optical methods.

HRXRD is an enabling technology in band-gap and strain engineering for III-V optoelectronics. XRF from light elements is strongly absorbed so the detected intensity is independent of film thickness. Conversely, the intensity from heavy elements is dependant upon thickness. XRR metrology offers several advantages. It is independent of the optical parameters n and k , it can measure opaque metal films and is sensitive to interfacial layers and interfacial roughnesses.

Advanced Solid-state X-ray Detector for the analysis of Thin-layered Structures

Joachim Woitok (PANalytical, The Netherlands)

Joachim informed everyone about a recently introduced solid state detector for thin film analysis - based upon the very latest pixel detection technology. Development was through the Medipix 2 Project which was run by a large international consortium.

The detector can operate in 0 D or 1 D and resolution can be further improved by

the active area from 6 to 1 mm². XRR scans can be carried out in 0 D mode with an analysis time of typically 10 mins. Rocking curve scans typically take 10 to 15 minutes with traditional detectors. With this ultra-fast solution scans can be obtained in 10 or so seconds for the same measurement quality.

Up-To-Date XRD-Techniques for investigating ultra-thin films and ultra-small features

Hugues Guerault (Bruker AXS, Germany)

The rapid progress in nanotechnology and nanomaterials has resulted in an increasing demand to characterize ultra thin films, nanostructure and organic thin films. Typically, X-ray probe sizes are 50 to 100 microns. A omega-2-theta goniometer is used with a Eulerian cradle, a ceramic X-ray tube and 50 micron mono-capillary. Hugues explained how stress can be measured for copper wire structures using the Cu(331) crystallographic reflection.

X-ray Probes of the layer and interface structure of nano-scale films for Opto-Electronics and Spintronics

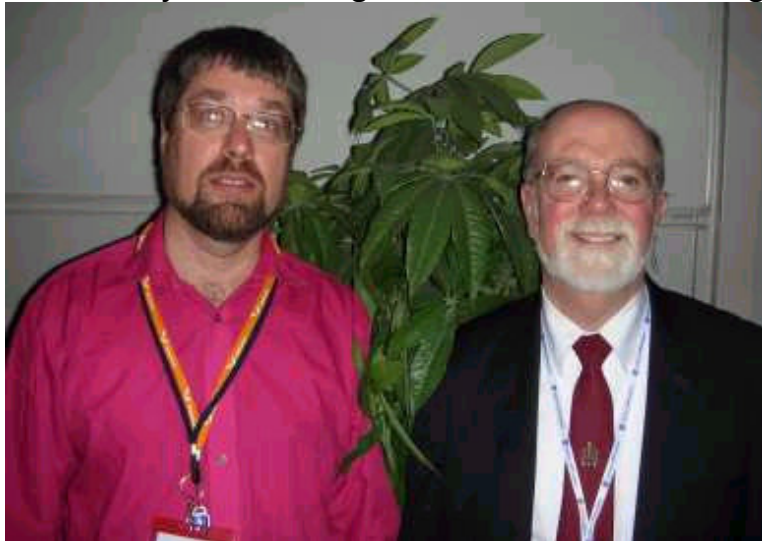
Brian Tanner (Bede)

A recent interest is the determination of the composition of $\text{Al}_x\text{Ga}_{(1-x)}\text{As}$ thin films on GaAs. Aluminium has been detected at the 1% level. Graded SiGe structures have also been investigated and Brian showed by use of reciprocal space maps, evidence for the asymmetric relaxation of test structures. He illustrated the application of laboratory-based grazing incidence in-plane diffraction to obtain independent twist and tilt data from GaN films grown on thin $\text{Al}_x\text{Ga}_{1-x}\text{N}$ buffers on sapphire. Brian went on to discuss grazing incidence X-ray reflectivity, This has now become a standard tool for the measurement of layer thickness and interface width in nanoscale thickness metal films for spintronic devices and data storage.

Mark Farnworth – Pilkington Group Limited

2007 Spring Meeting University of Canterbury 17-19 April 2007 Industrial Group - XRD Report

Industrial Group Keynote Lecture – 18th April 2007 Robert Snyder - Georgia Institute of Technology



Speakers - Left to Right: Jeremy K Cockcroft (IG Chair at time), Bob Snyder.

Robert began by saying that one of the most important needs of industry is to produce computer models for the behaviour of products and processes. The modelling of materials is an important element of this. For 10,000 years, material properties have been obtained from studies of chemical composition and of how the materials are affected by temperature and pressure. It was only in 1976 when a new 'tool' came on the scene - surface free energy. The origins of catalysts are borne out of the knowledge of surface free energy. For 100 nm structures the surface free energy is 1 % of the Total Free Energy - a relatively small contribution. Nanomaterials can be zero dimensional (quantum dots) or 1 or 2 or 3 dimensional. 'Surface shell' reconstruction is used for the study of nanomaterials. For nanomaterials the 'surface' can be a very significant part of the sample volume. Computer models are used.

However, there needs to be experimental constraints otherwise the models produced are nonsense.

X-ray Diffraction can be used to determine lattice parameters (peak positions), crystal structure (positions and intensities) and 'real' structure from the full XRD profile. 'Line' profiles can be used to separate size and strain broadening. They can also be used to determine defect density and dislocation density. Robert went on to say that there is a distortion of the lattice parameter as the sample reduces in size - towards 0.6x0.6x0.6 nm.

Nanostructures can be analysed with Transmission Electron Microscopy (TEM), Field Emission Gun - Secondary Electron Microscopy (FEG-SEM) and synchrotron focussed X-ray beams. XRD analysis of the core structure and microstructure gives information about stacking fault density / types, size / strain and preferred orientation. Analysis of the 'surface shell' give information about the Pair Distribution Function (PDF) and the 'shell' can also be analysed with X-ray Photoelectron Spectroscopy (XPS) and described using computer models.

Mark Farnworth – Pilkington Group Limited

2007 Spring Meeting University of Canterbury
17-19 April 2007 Industrial Group - XRD Reports Summary

Detailed reports can be found at <http://bca.cryst.bbk.ac.uk/bca/ig/ig.htm>

Diffraction from surfaces and Two Dimensional Crystallography

- 18th April 2007



Speakers - Left to Right: Tom Hase, Judith Shackleton (Co-Chair), Donna Arnold, Richard Morris (Co-Chair), Peter Laggner.

Structural Studies of Ordered Mesoporous Silica in Channelled Substrates

Donna Arnold (University of Cork) described research centred on establishing a relationship between etched silicon channels and their effect on mesoporous thin films. The results indicate that topography affects the placement and directionality of the pore structure.

X-ray Characterisation of Nanomagnetic materials

Tom Hase (University of Durham) discussed how X-ray data is providing insights in studies of arrays of nanoscale elements used in magnetic memory and high-density storage media.

SAXS and GI applications using a novel modular laboratory system

Peter Laggner (Institute of Biophysics and Nanosystems Research, Austria) described how a high brilliance 50 W microfocus beam offers a performance that compares with high power rotating anode systems and small synchrotron sources.

A Standardless future for Quantitative XRPD

- 19th April 2007



Speakers - Left to Right: Steve Norval (Chair), Rob Hill, Chris Gilmore, Paul O'Meara.

Random Mounts and Reproducibility? The Key to Standardless QPA

Gordon Cressey (Natural History Museum) showed that for materials with well established structures, calculated pattern intensities can be compared with whole pattern results.

Quantitative Analysis of Mixtures using High Throughput Instrumentation without the use of standards

Christopher Gilmore (University of Glasgow) described the PolySNAP computer program which uses the full powder diffraction pattern to carry out the quantitative analysis of mixtures from powder diffraction data

Rietveld Analysis and its applications to the cement industry

Rob Hill (Bruker AXS)

Rob showed how Rietveld analysis has been used to analyse Alite - caused by clinker dust in the pre-heated furnace.

Applications of Rietveld in Aluminium production

Paul O'Meara (PANalytical)

Paul described how the Rietveld method is used to control the manufacturing process and reduce the environmental impact.

2007 Spring Meeting University of Canterbury 17-19 April 2007 Industrial Group – XRF Reports Summary

Detailed reports can be found at <http://bca.cryst.bbk.ac.uk/bca/ig/XRF/xrf.htm>

For the second time at a BCA spring meeting, sessions were also provided for the XRF community - organised by the Industrial Group. The breadth and depth of the meeting was such that everyone had to be selective in the choice of presentations etc that they attended.

Workshop - XRF: where are we now?

Bruno Vrebos (PANalytical) discussed the pros and cons of EDS and WDS XRF instruments. He moved on to consider the use of XRF analysis for trace elements. **Margaret West** presented a workshop style talk on what XRF do these days. IngentaConnect is an internet search engine with more than 21 million article, chapters and reports. **Mike Dobby** (Bruker AXS) described online XRF, Total Reflection XRF (TXRF) and hand-held XRF as methods when the XRF instrument has to be taken to the sample.

Semi-quantitative

Heather Harrison (British Geological Survey) considered why you would use semi-quantitative analysis, what you may be looking for from the application and what sorts of results are obtained. **Belen Morales** (London & Scandinavian Metallurgical Ltd.) reported on the problem on the problem of carrying out analysis on materials when no suitable standards are available.

Calibration Samples

Neil Eatherington (British Geological Survey) discussed methods of calibration using single and multielement standards prepared as fused beads. Standards were conditioned at temperatures ranging from 220 °C - 1200 °C depending on the nature of the material and then prepared as fused beads by fusing 0.9g of standard with 9g flux at 1200 °C for 12 mins. **David Beveridge** (Harman Technology Ltd) discussed the determination of iron and arsenic contents in the fluorinated surfactant

Lodyne S103A. **Phil Russell** (PANalytical) discussed what normative committees are, their relationship to XRF analysis and the importance of involvement

XRF Applications - including cultural heritage

Luisa Carvalho (from Lisbon) spoke on the use of XRF for characterising documents detecting forgeries. **Clair Collins** (Oxford Instruments), described the use of a hand-held XRF analyser for examining "cultural heritage" objects. **Malcolm Haigh** (Spectro) discussed the use of a polarised-beam EDXRF unit. **Charles Gowing** (British Geological Survey) talked about a benchtop EDXRF. **Jean-Philippe Gagnon** (Claisse) showed how to get fast analytical results by fusion. **Margaret West** (West X-Ray Solutions) described some work that had been done for English Heritage. **René van Grieken** (Antwerp) discussed damage to buildings caused by atmospheric aerosols.

Environmental Issues

Nick Marsh (University of Leicester, Geology) discussed how XRFS is a reliable technique capable of determining a wide range of chemical data to enable mass balance calculations on the various contaminants in samples of lake sediments. **Chris Vanhoof**, (VITO, Belgium) described a new European Standard for the XRFS analysis of waste and soil. **Stan Piorek** (Niton) discussed how a compact spectrometer complies comply with EU RoHS, WEEE and ELV directives. **Ros Schwarz** (Oxford Instruments) described a micro-spot XRD instrument analysis of electrical components to meet EU RoHS directives

Small Angle Scattering – Special Interest Group Meeting Report 2 - 3 July 2007 ILL, Grenoble

This meeting was organised by **Richard Morris** (Morris Analytical X-ray), **Dave Taylor** (ICDD) and **Jeremy Cockcroft** (UCL) and hosted by the ILL and ESRF on the joint site at Grenoble. Arriving in Grenoble, the first impression is of how stunningly beautiful the scenery is. Lying in a valley, surrounded by the Alps, this would certainly be a pleasant setting to live and work. On to the site itself and after the briefest of stops at security we settled into our en suite rooms at the guesthouse. The meeting was the first Industrial Group meeting held outside of the UK.



Some of the delegates who attended the meeting

Day 1

Delegates were first treated to a tour of the ILL facility, by **Charles Dewhurst** and **Isabelle Grillo** (both ILL). As the reactor was undergoing maintenance, and no experiments were currently running, this was an excellent opportunity to get a close look at the experimental stations. Entrance to the reactor shell is through an enormous airlock, as the interior of the reactor is held at less than atmospheric pressure.

Peter Laggner (Institute of Biophysics and Nanosystems Research, Graz) gave a broad overview of the techniques of SAXS and SANS, starting with the basic theory of scattering. **Françoise Ehrburger-Dolle** (Laboratoire de Spectrométrie Physique, CNRS-UJF) described the types of polymers that can form liquid crystals and the phenomenon of inter-digitation. A series of SAXS experiments at different temperatures showed clear changes in the crystal layer spacings at specific temperatures

Richard Görgl (Materials Centre, Leoben) presented the NanoSTAR system from Bruker, a laboratory solution for SAXS studies. Recent improvements to this system were reported, including a new

microfocus X-ray source and a radiation-hard detector that requires no beam-stop.

Charles Dewhurst (ILL) on D33 described a newly installed Neutron Scattering (SANS) instrument capable of experiments in high magnetic field strengths.

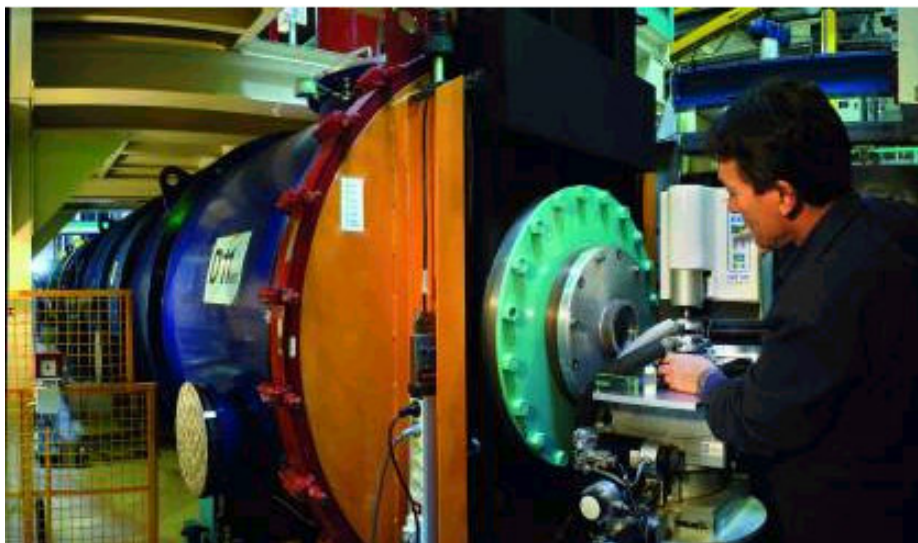
Adrian R. Rennie (Uppsala) presented results of in-situ studies of flowing samples with SAXS and SANS. The example given was surfactant templated synthesis of mesoporous silica

Alberto Saiani (Manchester) then talked about creating 3D-networks and hydrogels from self-assembling peptides. **Alexis Deschamps** (SIMAP, France) summarised some of the recent progress made in characterising

precipitates in metallic alloys using small-angle scattering. **Andrew Harrison** (ILL) who discussed applications of microwaves in materials science. **Jennifer Hiller** (Diamond Light Source Ltd) followed this with details of I22, the new beamline at Diamond.

Specifically designed for work on non-crystalline systems. **Peter Laity** (Cambridge) ended the day with details of recent work using SAXS to investigate the deformation of polymeric powders undergoing compaction.

Small Angle Scattering – Special Interest Group Meeting Report 2 - 3 July 2007 ILL, Grenoble



Photograph of beamline D11 are Copyright: ILL / Artechnique©

Day 2

This was kicked off by **Jean-Paul Simon** (SIMPAP) who spoke about ultra low k dielectrics for microelectronics. In order to reduce "cross-talk" between the copper tracks on integrated circuit boards, nanoporous materials have been developed to make use of the very low dielectric constant of air.

Christian Riekell (ESRF) followed this with an introduction to small- and wide-angle X-ray scattering (SAXS/WAXS) using micron- and submicron-sized synchrotron radiation beams. The small size of these beams allows scanning of a sample to build up a composite "image". This was demonstrated with a study of starch grains showing the internal morphologies.

Next, **Tim Wess** (Cardiff) discussed structural hierarchies in biological molecules. The properties of biological materials depend strongly on the arrangement and interactions of the molecules that comprise them. Using the example of fibrillin, an elastic component of connective tissues, Tim showed how the arrangement of the molecules could be

elucidated from SAXS data and how this related to the mechanical properties of the tissue.

Vladimir Kogan (DANNALAB & PANalytical BV, The Netherlands) presented the results of SAXS evaluation on nanoparticles, polymers and biological macromolecules conducted on the conventional X'Pert MRD diffractometer equipped with dedicated collimation system, optics and source.

Wim Bras (ESRF) then gave an entertaining talk titled "The Joy of SAXS and other toys". Using the example of crystallization in glass ceramics, Wim demonstrated the enormous benefit of combining SAXS data with that garnered from other techniques. Finally, **Richard Morris** (Morris Analytical X-ray) gave an overview of the history of Morris Analytical X-ray and shared some his knowledge of surfactant meso-phases. To close the meeting, Dave Taylor, thanked all speakers and delegates for making the BCA's first foray onto foreign soil such a success. Thanks were also given to the meeting's sponsors, without whom we would all have gone hungry on the Monday night

Andy Smith – UCL

Future Meetings 2007 / 2008

Pharmaceutical SIG - 7th November 2007

Chaired by Anne Kavanagh and Roy Copley.

Tal Austin

Understanding relative polymorph stability through structure and thermodynamics.

Jonathan Burley

Cocrystals and Other Complex Pharmaceutical Materials: Structure Solution from Powder Diffraction

Roger Davey

TBC

Chris Gilmore

Is PXRD the Gold Standard in High Throughput Experiments?

Jerry Heng

Crystal Engineering: The Importance of Surface Properties

Bill Jones

Screening for New Crystal Forms Based on Mechanical Activation of Mixtures

Maryjane Tremayne

Powders and 'Peer-Pressure': Pitfalls and Progress

Jacco van de Streek

Semi-automated Rietveld Refinement of Molecular Crystal Structures with DASH & TOPAS

Fred Vogt

X-ray Diffraction, Computational Chemistry and Solid-state NMR: A Multi-disciplinary Approach to Understanding the Pharmaceutical Solid-state

Autumn Meeting - 8th November 2007

CALL FOR PAPERS

Morning session:

Rietveld applications.

Organisers: *Steve Norval & Jeremy Cockcroft.*

Afternoon session:

Crystallography in Industry - a varied mix of short talks of interest to a wide audience.

Organiser: *Judith Shackleton.*

To offer a talk at these meetings please contact a session organiser.

The location

Travel directions by air, public transport or road: - download a 204kb PDF map and instructions.

Local organiser:

Dr Anne Kavanagh

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Full details can be found at

<http://bca.cryst.bbk.ac.uk/bca/ig/meet07AM.htm>

BCA Spring Meeting 2008

University of York, 8-10th April 2008

Full details can be found at

<http://bca.cryst.bbk.ac.uk/bca/ig/meet08DSM.htm>

XRD and Minerals- 15th May 2008

British Geological Survey, Keyworth, Nottingham

CALL FOR PAPERS.

This meeting will follow on from the previous day's XRF meeting at the same venue.

Organiser: *Martin Gill* Email:

m.gill@nhm.ac.uk

Speakers include:

Helen Maynard, *Edinburgh University.*

Caroline Kirk, *Natural History Museum.*

Eric Ferrage, *Laboratoire Environnement et Mineralogie.*

Jenny Huggett, *Petroclays.*

Full details can be found at

<http://bca.cryst.bbk.ac.uk/bca/ig/meet08MIN.htm>

X-RAY FLUORESCENCE (XRF) PAGE



NEXT XRF MEETING:

**British Geological Survey, Keyworth.
14 May 2008.**

We plan to build on the success of our May 2006 meeting with another joint meeting with the Atomic Spectroscopy Group, Analytical Division of the Royal Society of Chemistry on 14th May 2008. The model of short user talks went down well with delegates and even first time speakers were put at ease by the friendly atmosphere and excellent facilities. Now is the time to start thinking about what you could offer in a short presentation of your XRF work at the 2008 meeting. We are particularly keen to get talks specific to minerals to provide a link with our XRD minerals programme at the same venue on the next day. Please contact us (details on back page) to discuss a possible presentation at this meeting. To give you some ideas, a detailed report on the 2006 meeting with photographs is available on our XRF web pages. Type BCA IG into Google or: <http://bca.cryst.bbk.ac.uk/bca/ig/xrf/xrf.htm>. *Click the XRF meetings tab.*

Meeting Registration A registration form will be posted on the web nearer to the meeting date.

Sponsorship of this meeting is welcomed, more details on the web page.

Dates for your Diary:

14th May 2008 Joint BCA/RSC XRF meeting
BGS Keyworth, Nottingham.

Meeting Report:

XRF at the 2007 Spring Meeting

This meeting brought together some excellent presentations covering a wide range of applications and included several speakers from overseas and a poster from China. The commercial exhibition featured many XRF suppliers and there would have been more but unfortunately space wouldn't allow.

There is a full report of this meeting with photographs on the XRF web pages and a summary can be found on page 7 of this Newsletter. Some of the delegates are shown in the photograph at the top of this page.

WEB Newsletter: We are always on the look out for articles for the web and Newsletter, so if you have something to offer contact the editor.

Don't forget that we need your help in expanding our **supplier pages** on the web to build it into a really useful guide for XRF users.

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