

BCA IG Newsletter

August 2003

EDITORIAL

Welcome to this latest issue of the IG newsletter. It's been a relatively quiet summer for the Industrial Group after the excellent Spring Meeting at York. I'm sure that those of you who were able to attend the meeting enjoyed the lectures, posters and all the other events. The format was slightly different to previous years with everything crammed into three days. This made it a busy time for delegates moving between the various parallel sessions. Due to work commitments, I was able to take advantage of the new one-day registration and thoroughly enjoyed my brief visit on the Wednesday. The Industrial Group has also decided to change the usual format of the Autumn meeting to a two day meeting at Birkbeck College, London. With both joint and parallel sessions, it promises to be an excellent follow up to the event held near Coventry in 1999. The facilities are excellent and there are plenty of hotels in the immediate area. It also offers the chance for delegates to extend their stay into the weekend with an opportunity to experience the many attractions London has to offer. Please make a note of the dates in your diary NOW.

Phil Holdway

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Forthcoming Events 2003/2004

Industrial Group Autumn Forum II

13th-14th November 2003
Birkbeck College, London

Further details and registration form in this issue

For the latest information, please check the IG web pages or contact Dave Taylor with your specific queries.

BCA SPRING MEETING

6th – 8th April 2004, UMIST, Manchester

Make a note in your diary!
Further details in the next newsletter

Note

IG Logo

Removed

From here!

Charity Registration Number: 284718

World Wide Web addresses:

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

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

Thank you

Thanks to **Bruker-AXS** for sponsoring the cost of distribution of this edition of the Industrial Group Newsletter.

BCA SPRING MEETING

UNIVERSITY OF YORK

15th - 17th April 2003

A Summary of the Powder Diffraction Workshop

Organisers: Judith Shackleton and Dave Taylor with principal speaker, John Faber.

This session started on Tuesday afternoon with a most useful refresher on the basic theory of powder diffraction – much of which I remembered I'd forgotten!

With "An Introduction to X-ray Powder Diffractometry" by Ron Jenkins & Robert L. Snyder (John Wiley & Sons) being used as the major reference source.

It began at the very beginning with Laue photographs of single crystals and powders and from here went on to describe the unit cell, fractional co-ordinates, crystal systems, the 14 Bravais Lattices and Space Groups.

We then "learnt" about calculated density vs. measured density, lattice planes, Braggs Law, reciprocal space and calculated d spacings.

This led on to peak intensities (measured and calculated) and calculated diffraction patterns.

We then discussed the temperature factor, thermal diffuse scattering and counting statistics.

Briefly we discussed X-ray production, data recording and the fact that it is still sometimes better to record XRD data on film rather than with a counter.

On Wednesday, we all got up jolly early and were in our seats for the 8.30 am kick-off!

Dave Taylor described the development of the ICDD Database from the early days of the PDF (paper based, which I still find very useful) through to the PDF2 (CD-ROM).

Measured 2θ values from film; recorder paper or APD's are worthless unless the instrument is calibrated. From this we discussed the Reference Intensity Ratio, and Measurement Errors.

SRM1976 – the standard Corundum sample, Silver Behenate (for low angle work) and a mixed Lanthanum Hexaboride/Silver Behenate standards were all discussed, which led on to preferred orientation and the fact that sometimes (most of the time?) it is only possible to record oriented diffraction data.

John Faber then described the evolution of search indexing/search match routines especially those of Hanawalt (Don) and Fink (Hugo). He then went on to talk about GOM (Goodness Of Match), and the PDF 4 search /match program and other relational databases.

After tea in the afternoon we all got the opportunity to try out the next release of PCIWIN software. This is a (very) new PC based Hanawalt/Fink - Search/Match program.

It is a fairly complicated software package (obviously) and worked reasonably well with the examples provided. However, as with all new software, it still had a few bugs that need to be sorted before it is released as a

commercial product (which may well have been addressed by the time that you read this report).

Richard C.E. Morris
Huntsman Surface Sciences
Oldbury, UK.

A course photograph can be seen on the Industrial Group web site:
<http://bca.cryst.bbk.ac.uk/bca/ig/admin/news.htm>

New on the WEB:

Meeting Diary – a two year calendar of events.
Website of the month – a link to something of interest. Send your suggestions for future links or relevant UK meetings to Dave Taylor.

Would you like to describe your typical working day or your X-ray diffraction career?

This is your chance!!!

I am always looking for new ideas for articles to go in the newsletter. Two ideas I would like to think about are:

- An interview with an industrial crystallographer.
- A day in the life type article.

The first would involve answering a series of questions talking about your career in xrd such as earliest recollections and experiences, changes in xrd since you first started, and any humorous anecdotes. Finally perhaps a question on your thoughts about the future.

The second would involve a description of a typical day at the office/lab. I know that this might not be easy but most people do follow some kind of routine.

Please let me know your thoughts and please feel free to put forward any other suggestions for newsletter features.

Phil Holdway (editor)

European XRPD Standards Published

For the last few years I have been reporting to the UK powder diffraction community in various ways about the (slow) progress in writing standards for XRPD. It may come as a surprise to those who thought it would never happen, but the first two documents have now been published. In UK, they have British Standard numbers, i.e. 'BS' in front of the European numbers. The published standards are:

BS EN 13925-1:2003

Non-destructive testing. X-ray diffraction from polycrystalline and amorphous materials. General principles.

BS EN 13925-2:2003

Non-destructive testing. X-ray diffraction from polycrystalline and amorphous materials. Procedures.

The standards are not cheap to buy, particularly at full price, but your organisation may have less costly access to them. You can find more information on the BSI standards website: www.bsi-global.com/Corporate/Standards.xalter.

One interesting feature of the 'Procedures' document is the set of equations for basic diffractometry calculations. You will find most of these elsewhere, but this set is unique (I think) in that units are provided.

The following instalment on 'Instruments' should be published within the next year. An interesting aspect of this standard is the framework provided for describing and specifying diffractometers. Further instalments on 'Reference Materials' and 'Terminology' should appear soon after. Work is also in progress towards a standard on Residual Stress.

Thanks again to all those who have contributed to writing the documents, and with anticipation to those who will contribute to the remaining parts.

Steve Norval

1st Annual Biomaterials Workshop

Shrivenham 17th March 2003

Review of the 1st Annual Biomaterials Workshop

This Biomaterials Workshop was hosted by Cranfield University (Shrivenham campus) and held on 17th March 2003. It was the inaugural launch of a series of such meetings designed particularly to introduce new researchers to more established workers in the field and present new & emerging areas. The meeting attracted more than 80 delegates from as far away Barcelona and Belgium.

Delegates were welcomed to the workshop by the head of the sponsoring University department, Professor Cliff Friend and the president of the ABW council, Susan Etok.

The first presentation of the initial morning session was delivered by Professor Peter Marquis (University of Birmingham) who comprehensively described conventional and new material systems for use as dental restorative materials. He convinced everyone that finding alternatives to metallic amalgams is a high technology challenge and described the potential benefits of newly developed nano-particulates as they can provide the material quality and aesthetics required. The subsequent paper, delivered by Professor Andrew Lloyd (University of Brighton), presented an intriguing method for enhancing osteointegration through exploitation of part of the natural mineralisation process. In particular the role of calcium-binding phospholipids within matrix vesicles was described and Professor Lloyd showed how such lipids could, *in vitro*, self assemble into 3-D gels that may provide a suitable environment for rapid calcification.

Different fabrication routes to produce apatite coatings were expertly discussed by Dr David Grant (University of Nottingham). In particular, coatings formed by plasma spraying and laser ablation were compared with respect to their chemistry, surface topography and cell

interaction. Dr Grant emphasised the need to apply absorption corrections in diffraction measurements of crystallinity and pointed out the lack of any ASTM methodology in this respect. Subsequently, Dr Jonathon Knowles provided a persuasive description of the use of phosphate based glasses as biomaterials, and explained how the solubility of such materials can be significantly modified through the addition of Na or Ca ions. Dr Knowles explained that these glasses are relatively soluble in contrast to the bioglasses traditionally employed as biomaterials. He went on to show that, by annealing the glasses to crystallization, the subsequent phase mix can be employed to determine the amorphous structure. One use of such glasses is as 3-D fibre network structures to support cell growth systems. The final presentation of the morning session was provided by Dr Peter Wilshaw (University of Oxford) who described an elegant and novel approach to formation of a strongly adherent bioactive coating based upon a nanoporous alumina ceramic. Dr Wilshaw explained that the advantage of this technology is that pore diameter can be easily controlled and that these pores are typically $\sim 0.2 \mu\text{m}$, which is significantly lower than conventional porous materials used for biomaterial applications. Very low dissolution rates in culture media & osteoblasts were reported (0.03% in 10 days) and the rate of Al release is also apparently very small. Cell interaction with these surfaces was illustrated and the potential for loading the pores with bioactive materials discussed.

Following lunch, delegates had the luxury of being able to 'mix and match' between 3, carefully orchestrated parallel sessions. The talks were diverse, from *an industry perspective of plasma sprayed coatings* (Robert Scott, Biomet-Merck) to *bone fragility & its causes* (Peter Zioupos, Cranfield University) and an *introduction to the medical devices faraday partnership* (Faye Smith, MDPF).

The final 2 formal presentations of the day were from Professors Joe Franks and Jim Elliott. Professor Franks (Brunel University) described a room temperature fabrication route for the formation of diamond like carbon coatings with high substrate adherence. These were described as being hard and flexible and good for preventing thrombus formation. Finally, Professor Elliott (Queen Mary), who has been described as one of the most notable pioneers in apatite structural chemistry, carefully described the key ionic packing arrangement of the apatite lattice and pointed out that most of the space is occupied by phosphate ions packed into a pseudo-HCP arrangement. He went on to illustrate several ionic substitution possibilities and, in particular, carbonate substitution into phosphate and hydroxyl sites. He finished by indicating that apatites can still produce surprising results and described how his recent work has shown evidence of formate substitutions.

Overall, the day offered a broad and diverse programme that reflected the range of interests of the biomaterials community. All the lectures were of high quality and well received by all the delegates. A lunchtime poster session (best poster award going to J. Blaker, Imperial College for *Silver doped bioactive glass coated sutures for tissue engineering and wound healing applications*), and a cake cutting ceremony also served to 'entertain' the delegates.

The success of this first workshop was due principally to its professional organisation and delegate & speaker enthusiasm. There is no doubt that these workshops will continue to provide a high quality forum for encouraging collaborations and promoting awareness & understanding in the field. Further details of the next workshop will be announced in due course at www.cranfield-biomaterials.com.

K.D. Rogers April 2003

Articles Wanted:

Why not put pen to paper and write a short article for our next Newsletter. There are lots of examples to give you some ideas in our Hints & Tips section on the WEB. Don't forget, if you attend a conference, please send in an article about it.

We are also looking to expand the range of Industrial Applications of XRD on our WEB Site.

All we need are a few well chosen pictures and a few words. How about something on CEMENTS, MINERALS, MUSEUMS, PHOTOGRAPHY, DETERGENTS, PIGMENTS, POLYMERS

Newsletter Mailing

To keep cost down and to ensure that the newsletter gets to the appropriate people it is essential that we know your correct address. Also if there is a more appropriate contact in your organisation or if you no longer require a copy please let us know by contacting any of the committee officers.

The newsletter is also now posted on our WEB site

(<http://bca.cryst.bbk.ac.uk/BCA/IG/index.htm>)

If you would like an e-mail notification of the WEB posting rather than a paper copy, then send an e-mail to djtaylor@lineone.net – with the title SUBSCRIBE WEB NEWS

Please contact any member of the Industrial Group Committee (see back page for contact details) with any suggestions for future meetings, offers of presentations, offers of hosting a meeting and nominations for the Committee or the group award.

CHAIRMAN'S REPORT for 2002

Professor Chris Frampton's report to the AGM at the University of York, April 2003

Every year there appears to be fewer and fewer true industrial crystallographers. It seems as if current working practices and management ideas in industry do not allow for the apparent luxury of an in-house diffraction laboratory. The current fashion is that a good deal of this work is currently being contracted out to University departments and specialist contract analytical companies. This year has been fairly light on meetings reflecting on the feeling that it is becoming harder and harder to justify the time away from the bench. Our meeting program consisted of the annual Spring meeting held at the University of Nottingham and the Autumn meeting held at Hulme Hall, Manchester.

The Spring meeting in Nottingham consisted of three workshop sessions based around the following topics, thin films, an introduction to amorphous materials and a powder diffraction surgery. From the comments I have received from members of the group these were all deemed to be excellent sessions and very useful. I would like to thank all of the people responsible for organizing these sessions in particular, Paul Fewster, Judith Shackleton, Jeremy Cockcroft and Dave Taylor.

The Autumn meeting kept again to the tried and tested format of a "Crystallography in Industry" meeting organized and hosted by Judith Shackleton at Hulme Hall in Manchester. This was a super venue for the meeting and the science was also first rate. For me the highlight of this meeting was the great pleasure at presenting Jo Jutson with an Industrial Group Award for her work on micro-diffraction and her great support of the Industrial group over past years. Her paper

"From Spinel Analysis to Micro X-ray Diffraction - a Personal View of Applications and Advances" was an excellent overview of the progress in X-ray diffraction and instrumentation over the span of her career. Jo chose a Beevers model of a Spinel phase for her award.

On a more depressing note we were all saddened to hear of the death of Ron Jenkins in June 2002. Ron was a larger than life character and an outstanding teacher. My first encounter with Ron Personally was fairly recent at the BCA Meeting in Leeds. I was fortunate enough to be the recipient of the IG poster prize that year which was a personally signed copy of his book. This is something I will certainly treasure for years to come.

A recent survey was conducted regarding the topics for future Industrial Group meetings and I would like to thank all those who sent in replies and to Brett Cooper for collating the results. We have tried to reflect the wishes of the group when putting the program together for this years Spring meeting on the basis of this survey with Polycrystalline materials, Phase ID, and QA being the major subjects this year.

Our next meeting is going to be in the Autumn and will hopefully be held over two days having a similar format to the successful IG Forum held in 1999. Program and dates will be available shortly.

Finally we are about to have a change in the committee this year and I would like to thank Phil Holdway for his sterling efforts as Secretary/Treasurer. I would also like to thank departing committee members Clare Anderton and Paul Fewster for all their hard work. Working with all of the people on the committee is a great pleasure and I hope the new members enjoy the experience.

Bruker – AXS Ltd User Group Meeting

Yew Lodge Hotel, Kegworth, 12th – 13th May 2003

About 40 delegates were present, probably slightly down on previous meetings. A reflection perhaps of hard times; at least for industrial users. After gathering at lunchtime, the meeting began with a series of presentations by users. First up was Darren Derbyshire (Aventis) who spoke on XRPD Method for the quantification of Anhydrous API in a Monohydrate API/Anhydrous API/Carrier Mixture. Darren explained that existing methods were not accurate enough due to the presence of Lactose. His method involved removing the lactose, which then allowed improved observation of the anhydrous peak. Using peak areas anhydrous levels as low as 1% could now be determined. Louise Male (University of Bath) spoke about Structure Solution of Large Organometallic compounds from Powder XRD Data. Louise spoke about Pt containing compounds whose optoelectric properties were affected by intermolecular interactions. She explained the method of structural solution, which involved a series of steps starting with indexing of powder patterns through to Rietveld refinement. Both lab x-ray and synchrotron radiation were used and her results were very encouraging. Judith Shackleton (University of Manchester Materials Science Centre), spoke on Lots of Stress in the Materials Science centre. Judith spoke about the measurement of residual stresses using x-rays at Manchester using a 2-dimensional detector. Judith explained why there is a need to measure these stresses in engineering components; in particular to improve our understanding of premature failure through fatigue. Judith mentioned other techniques, which can be used to measure RS such as hole drilling, magnetic

methods and sectioning. She talked about the various advantages and disadvantages of the different methods and explained the use of the 2-D detector. Judith finished with some examples such as very large castings and railway lines where portable methods are very useful. The morning session ended with a talk by Duncan Gregory concerned with Powder Diffraction of Air Sensitive Materials. He described a cell, which had been built to look at materials that are hygroscopic and air sensitive. Ba_2N , Ca_2N and $SrTiN_2$ were examples of compounds investigated. After a coffee break, David Beveridge (Ilford) spoke about Applications of X-ray Diffraction in the Imaging Industry. David began by explaining that despite the rapid rise in digital photography, silver halide work will remain important for sometime to come. He then went on to explain the wide range of samples investigated using x-ray diffraction from various types of inks and media (eg paper) work on pigments many of which do not have patterns in the diffraction database. Mary Vickers (University of Cambridge) spoke on Is Reflectometry Useful? Mary explained reflectometry and the type of information it can give, particularly in the case of multilayered materials. She showed some typical data for InGaN/GaN and explained how the information could be extracted and the importance of modelling. The final part of her presentation dealt with instrumentation; in particular the need for accurate alignment. Anne Kavanagh (AstraZeneca) was next up speaking on using Xrpd to Detect Crystalline in

Continued on page 9

Industrial Crystallography Forum II

Birkbeck College, London 13th -14th November 2003

Meeting Fees: £50 (£25 concessions) – Non members supplements apply

Thursday 13th November

10:00 Registration
10:30 Coffee
11:00 – 12:30 Crystallography in Industry –
Non-Ambient

11:00 In Situ Diffraction from Materials and
Macromolecules under Microwave
Irradiation. – Andrew Harrison,
University of Edinburgh

11:30 To be confirmed

12:00 To be confirmed

12:30 LUNCH – a buffet will be provided.

14:00 – 15:15 PARALLEL SESSIONS

A. Pharmaceuticals – Non Ambient applications

14:00 Relative Humidity – Brett Cooper,
Merck Sharpe & Dohme.

14:25 Terry Threlfal – University of York

14:50 Bob Lancaster - GlaxoSmithKline

B. Crystallography in Materials Science

14:00 Use of Intense Radiation Sources in
the study of Functional Materials,
Paul Barnes, Birkbeck College,

14:25 Keith Rogers, RMCS Cranfield
University.

14:50 To be confirmed

15:15 TEA

15:45 – 17:00 PARALLEL SESSIONS

A. Pharmaceuticals – Polymorphism & Case Studies

15:45 Polymorphic Drugs Science, Fashion
or Valuable products – Chris
Frampton, University of Southampton.

16:10 Craig Grant

16:35 A contribution from Astrazeneca

B. Non Ambient Applications

15:45 To be confirmed

16:10 To be confirmed

16:35 Catalysts – Steve Norval, ICI plc

17:00 Adjourn for Evening programme

17:45 Introduction to Ron Jenkins Memorial
Lecture – Dave Taylor

18:00 Ron Jenkins Memorial Lecture

Friday 14th November

09:30 Industrial Group Award Lecture

Adventures in Crystallography in the Gas
Turbine Industry
Colin Small, Rolls-Royce plc.

10:30 COFFEE

CONTINUED ON NEXT PAGE

INDUSTRIAL CRYSTALLOGRAPHY FORUM II

14th November continued

Bruker AXS User Group Meeting

Continued from page 7

11:00 – 12:30 PARALLEL SESSIONS

A. Pharmaceuticals – Amorphous Materials

11:00 Structural Characteristics of the Amorphous Phase: A computer modelling approach – Stephen Watt, Pfizer.

11:30 To be confirmed

12:00 To be confirmed

B. Industrial Applications

11:00 X-ray Diffraction of New Materials
Phil Holdway, QinetiQ Ltd

11:30 Protein Derived Nanoparticles –
Applications and Analysis - David
Gleeson, NanoMagnetics Ltd.

12:00 Applications of XRD in the Imaging
Industry – David Beveridge, Ilford Ltd

12:30 LUNCH – a buffet lunch will be provided

**14:00 – 15:30 INSTRUMENTATION – Past,
Present and Future.**

14:00 Past – To be confirmed

14:30 Present – Judith Shackleton, Manchester
Materials Science Centre.

15:00 Future – **Alun Bowen Lecture**

15:30 TEA & CLOSE

Please keep an eye on the Industrial Group Web
Site: <http://bca.cryst.bbk.ac.uk/bca/ig/ig.htm> for the
latest programme information, details of local
hotels and to download a spare registration form.

Amorphous Drug. She explained that amorphous drugs work better because they are more soluble in water. Over time amorphous form will crystallise. This will be affected by storage conditions. Anne showed that one way around this was to form a solid dispersion in a polymer. She went on to show some examples and typical data collected and how modifying this enabled limits of detection down to 1% to be obtained. The final talk of the day was given by Gordon Barr, (University of Glasgow), on SNAP 1D Pattern Matching and Polymorph Hunting. The program deals with quantitative and semi-quantitative determination of unknowns and deals with factors such as Peak shift and overlap, texture and poor data quality. He then showed an example of quantitative analysis (the BCA IG round robin samples) where he achieved the best results. Finally, the program can be used to analyse other x-y data (eg. IR). Delegates then had dinner followed by a get-together in the bar, where everyone had an enjoyable time.

The last session on Tuesday morning involved a number of presentations by Bruker concerning new developments. These included a humidity and temperature system and high temperature chambers. Chris Cowden spoke about compliance issues and the morning ended with a presentation on Combinatorial Screening. After another excellent lunch, everyone departed. Thanks to Bruker AXS for a very useful meeting.

Phil Holdway QinetiQ Ltd

New Scheme for BCA Membership via Industrial Group NON MEMBER FEES

The Industrial Group has introduced an increase in meeting fees for NON BCA Members. Details follow:

- NON Members will now pay more than members to attend an Industrial Group meeting.
- However, anyone paying the higher NON MEMBER fee has an option to fund BCA Membership or even BCA Membership renewal.
- Anyone opting to take advantage of using the extra payment to buy membership will be enrolled for the NEXT full membership year (January to December).
- Existing BCA members can opt to pay the higher NON Member fee and use the extra payment to fund the following years membership RENEWAL.
- Concessions (Retired, Unemployed and Full time students) are also included in the scheme.
- The extra cost payable by NON Members will be equivalent to the highest price BCA membership fee be it full or concession category.
- The meeting registration form includes all the details required to process the optional BCA membership application.
- All membership applications for a particular year will be processed after 30th September and NEW members may qualify for a complementary copy of that years December edition of Crystallography News.

Your questions answered:

Question: Why change from the old scheme of including free membership in the meeting fee?

Answer: *The old scheme involved a significant administration burden and some mistakes were inevitable. Members attending more than one meeting in the year effectively subsidised other attendees. The costs of arranging meetings and supplying lunches are*

increasing and the updated scheme will allow the Industrial Group to keep its meeting fees as low as possible for BCA members but still include a route into BCA membership or renewal.

Question: Is it less expensive to independently join the BCA rather than pay the NON MEMBER FEE ?

Answer: *The additional NON MEMBER cost levied by the Industrial Group is the same as the equivalent BCA membership fees when paid by cheque or credit card. However, the BCA does offer discounts for payment by Standing Order and to some members of the Institute of Physics.*

Question: I am not a BCA member and will be attending two IG meetings this year. Do I need to pay two NON MEMBER FEES?

Answer: *If you want to become a BCA member then your best option is to independently enrol for BCA membership and allow a week before you register as a BCA member for the first IG meeting. All the forms and information you need to become a BCA member can be found on the BCA Web site. If, for any reason, you don't want to become a BCA member, then you will have to pay the NON MEMBER FEE for ALL the meetings you plan to attend.*

Question: How do I use the scheme to renew my membership?

Answer: *Pay the higher NON MEMBER FEE for the meeting and tick the "Renew a current BCA Membership" Box .*

Question: Why hold membership applications until the following year?

Answer: *To keep things simple. Often our qualifying meetings are well into the year so you get the best value, a full years membership. It also gives the IG flexibility to administer the scheme more efficiently.*

Question: I am attending an Autumn meeting in November 2003 what membership period will be covered?

Answer: *Membership is for the next full year so in*

New membership scheme (continued from previous page)

this case it will be January 2004 - December 2004.

Question: What happens if I join through the scheme at a meeting in 2003 but I don't attend a meeting in 2004 and miss the option of renewing my membership?

Answer: *Your BCA membership will become due for renewal in January 2005. You will receive a membership renewal notice by post from the BCA and an appropriate payment form to use if you wish to renew your BCA membership for 2005.*

Question: What is the difference between a current and lapsed member?

Answer: *The only difference is that details of a lapsed member may still be available on our membership database and it may be possible to resurrect the old entry.*

Question: What is the definition of "RETIRED"?

Answer: *Someone who is no longer in full time employment.*

Question: What is the definition of "STUDENT"?

Answer: *Someone who is a FULL TIME STUDENT.*

Question: What is the definition of "UNEMPLOYED"?

Answer: *Someone who is no longer in full time employment but is actively seeking work.*

Question: Why do I need to fill out all the information about BCA Groups?

Answer: *The registration form combines all the information required for the meeting registration and for enrolling as a BCA member. The information on BCA groups helps to identify your specific interests and allows the Groups to keep you informed of their activities.*

Question: I want to attend an Industrial Group meeting but don't want to become a BCA member what should I do?

Answer: *Pay the NON MEMBER FEE and tick the box at the bottom of the form "Please tick this box if you have paid a NON MEMBER FEE but do NOT wish to take up BCA Membership".*

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**British Crystallographic Association
Industrial Group**

The BCA is a charity with Registration Number 284718

Forum II

Birkbeck College, London, 13th - 14th November 2003

I wish to attend this meeting: Signature _____ Date _____

For students only: Supervisor Signature _____ Course Completion Date _____

Title: _____ Initials: _____ Name: _____

Address: _____

_____ Postcode: _____

Phone: _____ Fax: _____ Email: _____

Meeting Fees: Please tick one box only and send appropriate remittance.

BCA Member £50 ☐ **Concessions** £25 ☐ (for students, retired and unemployed)

NON Member* £65 ☐ **Concessions** £32.50 ☐ (for students, retired and unemployed)*

The fees for this meeting include buffet lunches with items suitable for vegetarians

Please tick one method of payment

☐ I have paid by BACS and my remittance of £ has been sent to:

a/c 0412698 at 30-19-14 Lloyds Bank, Birmingham. A completed registration form must be sent to the address given below.

OR:

☐ I enclose my cheque for £ payable to "BCA Industrial Group"

Send completed form to:

Ms Judith Shackleton

**Manchester Materials Science Centre,
Grosvenor Street, Manchester. M1 7HS**

Tel: 0161 200 3581 Fax: 0161 200 3586 Email: judith.shackleton@man.ac.uk

***ONLY for those paying NON Member fees for this meeting.**

The Industrial Group will enrol you as a new BCA member or renew your existing membership for the 2003 membership year if you have paid the NON MEMBER FEES and complete the rest of this section. Please assist the BCA's Administrative Office by ticking one or more of the boxes to indicate your current membership status.

The BCA has four groups to cater for specific interests of members. **Please tick one Main Interest Group (preferably Industrial) and any number of Special Interest Groups.** The Groups which you select will tell you of their activities.

Renew a current BCA Membership.	
Renew a lapsed BCA Membership	
Enrol as a NEW BCA Member	
I apply for Unemployed Concession	
I apply for Retired Concession	
I apply for student Concession	

Main	Group	Special
	Industrial	
	Chemical Crystallography	
	Physical Crystallography	
	Biological Structures	

Please tick this box if you have paid a NON MEMBER FEE but do **not** wish to take up BCA ☐ Membership