

SGT NEWS

Glass: the art of science

The Society of Glass Technology is hosting the 2006 meeting of the European Society of Glass Science and Technology. The meeting will be held on 10-14 September 2006 on St Peter's Campus of the University of Sunderland in the city of Sunderland, UK.

The ESG Conference is held every two years in a different host country. The scope of this conference is to promote glass science and technology and, in particular, to enhance interaction among experts working on diverse areas such as glass manufacturing, glass archaeology, art and environmental issues, as well as glass science and applications.

The ESG meetings normally feature two or more parallel sessions, one covering scientific research and the other discussing industrial and technological developments. The Sunderland meeting will draw some of its influence from the host city and the rich heritage of glass making and the strong support of current glass making that is provided locally from the National Glass Centre and the glass based courses at the University.

The last ESG conference, held in Athens in 2004, included around 80 oral papers and 40 poster presentations covering a wide range of interests including Ta-Luft implementation of the European glass Bref; glass melting economies; sol-gel synthesis of bioglass composites; development of high gain tellurite and borophosphate glasses for broadband applications; and glass contact performance of pot materials. Peer reviewed proceedings of the Athens meeting were published in the April 2005 issues of *Glass Technology* and *Physics and Chemistry of Glasses*.

The 2006 proceedings will also be published in these journals under their new collective title of *European Journal of Glass Science and Technology*. The second announcement and call for abstract submissions were sent out in December 2005 and the abstract submission deadline is May 2006.

The meeting will follow the outline below:

Sunday	Registration ICG Technical Committee Meetings Workshops Opening reception
Monday	Opening ceremony Keynote lecture Three parallel sessions covering science, technology and art Student reception
Tuesday	Three parallel sessions Evening reception in Sunderland museum
Wednesday	Three parallel sessions Conference banquet
Thursday	Day trip Technical sessions and workshops Closing ceremony

The technical sessions will cover the main conference themes. Each session will be introduced by a keynote lecture lasting 40 minutes. Individual lectures will then be timetabled to last 20 minutes including five minutes for questions. A full range of audiovisual equipment will be available. All presentations will be given in English.

An extensive social programme for participants and accompanying persons will include the opportunity of seeing more of Sunderland, its environs, a visit to the local museum where an exhibition of locally produced glass is scheduled, and a banquet planned in the Stadium of Light, the home of Sunderland AFC. Nearby attractions include Beamish Museum, Alnwick Castle and Gardens, Durham Cathedral and Hadrian's Wall.

The following organisations have provided support for the meeting: *Glass and Glass International*, Omya, Calumite, Barrs, Borax, Laidlaw Drew, WBB Minerals, British Glass Manufacturing Federation, Pieroth, Longcliffe, GTS, Graphoidal, DSF, Allied Glass, PSR, Glassworks Services, Teco, Zedtec, KTG Engineering, University of Sunderland, Sunderland City Council, Energy Institute, Tyne & Wear Museum, National Glass Centre, Pilkington Glass, and Berryman.

Further information can be obtained from Christine Brown at the Society or the ESG2006 website: www.esg2006.co.uk

European Journal of Glass Science and Technology

The Society of Glass Technology and the Deutsche Glastechnische Gesellschaft have reached a historic agreement to combine their journals from 2006 into two new series entitled *Glass Technology: European Journal of Glass Science and Technology Part A* and *Physics and Chemistry of Glasses: European Journal of Glass Science and Technology Part B*. Dr Russell Hand and Prof Malcolm Ingram will continue as senior editors and will be joined by Dr Ulrich Roger and Prof Christian Rüssel as regional editors in Germany. This agreement was approved unanimously by both the Council of SGT (18th May 2005) and the Board of DGG (23rd May 2005). A Memorandum of Understanding was formally signed by Dr John Parker as president of SGT and Prof G Müller (DGG president) and Dr Roger (DGG managing director) at a ceremony which took place at the opening reception of the DGG Annual Meeting in Würzburg on 23rd May 2005. Messrs John Henderson and Ray Duly as honorary secretary and honorary treasurer, respectively, were also signatories to the Agreement.

Anyone wishing to publish in the first volume of this new series should submit their paper for consideration as soon as possible since the level of interest is already high. Both the SGT and DGG offices can progress papers through the peer review system:

Deutsche Glastechnische Gesellschaft (DGG), Siemensstraße 45, D-63071 Offenbach, Germany. Submissions to Dr Roger (Part A) or Professor Rüssel (Part B).

Society of Glass Technology, Unit 9, Twelve O' Clock Court, 21 Attercliffe Road, Sheffield S4 7WW, UK. Submissions to Dr Hand (Part A) or Professor Ingram (Part B).



President
Dr J M Parker
FSGT

Honorary Secretary
Mr J Henderson
FSGT

Treasurer
Mr R Duly
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NCM9 conference papers available

The Ninth International Conference on the Structure of Non-Crystalline Materials (NCM9) was held on Sunday 11 to Thursday 15 July 2004 at the Radisson Hotel, Corning, NY, USA. The meeting was organised by the New York State College of Ceramics at Alfred University, Alfred, with Professor Alastair Cormack as conference chairman.

Conference topics covered included: structure, measurement and interpretation, modelling, thermodynamics of glass-forming systems, nanostructural and microstructural features, surfaces, structures at high temperatures or high pressures, inter-relationships between structure and properties, relaxation phenomena, materials and preparation, metallic glasses, chalcogenides, new glass-forming systems, novel preparation of traditional glasses, and novel applications of non-crystalline materials.

There were ten invited papers, 52 papers and 21 posters presented during the meeting.

CONFERENCE PROCEEDINGS

Papers from the conference were submitted for peer review and 33 of these were accepted and published in the August 2005 issue of *Physics and Chemistry of Glasses*.

The contents are listed below:

- The structure of CaSiO_3 glass and the modified random network model – RN Mead & G Mountjoy
- Crystallisation behaviour and structural order of iron containing aluminosilicate liquids – N Lönnroth & Yuanzheng Yue
- Structural characterisation of rare earth rich glasses for nuclear waste immobilisation – I Bardez, D Caurant, P Loiseau, N Baffier, JL Dussossoy, C Gervais, F Ribot & DR Neuville
- Double diffusive convection in alkaline silicate melts: first experimental results – C De Campos, DB Dingwell & KT Fehr
- Water: an elusive component of silicate melts – P Richet
- Aluminium coordination in natural silica glasses from the Libyan Desert (Egypt): high field NMR results – JF Stebbins, Lin-Shu Du & G Pratesi
- Infrared spectroscopy of germanium dioxide (GeO_2) glass at high pressure – PV Teredesai, DT Anderson, N Hauser, K Lantzky & JL Yarger
- Water in silicate glasses and melts of environmental interest: from volcanoes to cathedrals – F Farges, S Djanarthany, S de Wispelaere, M Munoz, B Magassouba, A Haddi, M Wilke, C Schmidt, M Borchert, P Trocellier, W Crichton, A Simionovici, P-E Petit, M Mezouar, M-P Etcheverry, I Pallot-Frossard, JR Bargar, GE Brown Jnr, D Grolimund & A Scheidegger
- Features of the relaxation in hyperquenched inorganic glasses during annealing – Yuanzheng Yue
- Raman spectroscopic studies of quaternary tellurite glasses containing Nb_2O_5 and Ta_2O_5 – G Senthil Murugan, T Suzuki & Y Ohishi
- Structural studies of bioactive sol-gel phosphate based glasses – D Carta, DM Pickup, RJ Newport, JC Knowles, ME Smith & KO Drake
- X-ray diffraction and solid state NMR studies of the growth of hydroxyapatite on bioactive calcia:silica sol-gel glasses – LJ Skipper, FE Sowrey, R Rashid, RJ Newport, Z Lin & ME Smith
- The germanate anomaly: Is the presence of five- or six-fold Ge important? – HM Wang & GS Henderson
- Structural differences between lithium silicate and lithium germanate glasses by Raman spectroscopy – LG Soltay & GS Henderson
- An EXAFS study on iron-cobalt-alumina nanocomposites prepared by the sol-gel method – A Corrias, MF Casula & G Navarra
- Structure of silver nanoparticles in silicate glass and of nanoparticles-glass interfaces – M Dubiel, X Yang, R Schneider, H Hofmeister & K-D Schicke

- Overview of the environment of Ni in oxide glasses in relation to the glass colouration – L Galoisy, G Calas, L Cormier, B Marcq & M H Thibault
 - Structural and optical properties of nickel zinc aluminogallo-silicate glass – T Suzuki, G Senthil Murugan & Y Ohishi
 - Doped low Tg glasses as phosphor materials – AS Geleil & AG Clare
 - Structural aspects of Judd-Ofelt oscillator strength parameters: relationship between Nd dissolution and its local environments in borosilicate glasses – Hong Li, Liyu Li & DM Strachan
 - Thermal kinetics of glass simulations – LR Corrales & Jincheng Du
 - Structural transitions in disordered phases of germanium under rapid quenching and pressuring – J Koga, F Yonezawa, K Nishio & T Yamaguchi
 - The structure of TiO_2 - SiO_2 and CaO - SiO_2 sol-gel glasses from neutron diffraction and solid state NMR using isotopic enrichment of titanium, calcium and oxygen – DM Pickup, FE Sowrey, LJ Skipper, RJ Newport, P Gunawidjaja, KO Drake, ME Smith, P Saravanapavan & LL Hench
 - Inorganic colloidal glasses – relations between preparation and structure – H Roggendorf, H Wolter, J Trempler, J Runge, K Busse, R Adhikari, J Kressler & GH Michler
 - A contribution to the structure of Ge-Se-Ag glasses – L ĩervinka, J Bergerová, L Tichý & F Rocca
 - Thermal analysis of glass covered amorphous metal wire and amorphous ribbon – FC Raszewski & AG Clare
 - Mechanical properties of glass coated amorphous metal fibre – B Doud, W LaCourse & M Conklin
 - Origin of photostructural changes in chalcogenide glasses: negative-U centres excitations – MI Klinger
 - Rare earth doped glasses for conversion of near ultraviolet light to white light – Yi Zheng & AG Clare
 - Structure of liquid Cu_6Sn_2 studied by neutron and x-ray diffraction – I Kaban, S Gruner, W Hoyer, P Jövári, RG Delaplane & A Wannberg
 - Superstructural units in vitreous and crystalline caesium borates – R Haworth, JL Shaw, AC Wright, RN Sinclair, KS Knight, JW Taylor, NM Vedishcheva, IG Polyakova, BA Shakhmatkin, SA Feller & DW Winslow
 - The structure of permanently densified GeSe_2 glasses – Q Mei, PV Teredesai, CJ Benmore, S Sampath, J LYarger, E Bychkov, J Neufeind & K Lienenweber
 - Neutron diffraction from levitated liquids – a technique for measurements under extreme conditions – JKR Weber, JE Rix, KJ Hiera, JA Tangeman, CJ Benmore, RT Hart, JE Siewenie & LJ Santodonato
- This can be bought on its own for £50 by non members or £20 to SGT members.

New books

The Society of Glass Technology will publish the following titles in 2006:

- *Fundamentals of Inorganic Glasses* (second edition) by Arun Varshneya
 - *Glass to Metal Seals II* by Ian Donald
 - *Glass blowing* by Charles Bray (second printing with minor additions)
 - *Curiosities of Glass Making: With Details of the Processes and Productions of Ancient and Modern Ornamental Glass Manufacture* by Apsley Pellatt transcribed and edited by Michael Cable
- More information will follow on these books as the year progresses.



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Annual meeting report

The Society of Glass Technology 2005 annual meeting in Sheffield featured industrial sessions with particular emphasis on raw materials suppliers to the glass industry. Tim McGurk looked at Lochaline Mine, a Scottish silica sand mine that is operated by Tarmac producing 100,000 tonnes per year of high quality silica sand. The source has a reserve estimated to be worth 4 million tonnes with possibly 40 million tonnes available.

The sand deposit is an average 99.7% silica of uniform grain size, an ideal glass making sand; iron impurities are low. The main extraction zone is 5m high.

The deposit was exploited locally for many years but World War Two saw the mine opened fully by C Tennant & Sons, then Tiling Construction/Tilcon before Tarmac took over. Tarmac is a division of Anglo American. The five millionth tonne was sold in 2004.

Traditional mining methods are used. Processing involves crushing and screening where particles greater than 1mm are rejected and dumped back in the mine working. Sand is then washed to remove silts, scrubbing and dewatering, >90 µm sands are rejected and put back in the workings.

Iron content on shipping is 0.014 Fe₂O₃. No magnetic extraction of iron is required. The sand is taken out by sea in 2200 tonnes shipments, much of it goes to Northern Ireland and Runcorn.

Roger Pechey of Harriman Chemsult described the global soda ash market dynamics. The glass industry is the most important consumer of soda ash and takes around 52% of output. There is no balance in regions in their supply and demand: Asia needs imports, the US is the largest exporter; there is lots of interregional trade of material.

Europe is the highest cost region for production and manufacturers there are vulnerable to lower cost supply. The market is mature and more cullet is being used in the batch and there is competition from other materials.

The Solvay process is used to produce synthetic soda ash: the company Solvay dominates the market. Transportation costs are a significant factor in Europe. Imports from the US take between 1% and 10% of the market, and there are some exports from Europe mostly by Solvay to South America and Asia.

Prices dipped with a drop in the overall European economy but are now picking up. North American soda ash supplies are all mined trona ore; local demand is flat, so income has to be made from exports. Some producers have started up and had problems, going into Chapter 11 bankruptcy protection, or mothballing plant. Export prices are better. In Asia, China is the biggest producer and consumer of soda ash, made by the Solvay, Hou and trona processes, and producers export to other parts of Asia.

Coke price increases are a major threat to the smaller producers; they rose by \$15-20 per tonne. China is the biggest producer and exporter of coke, and its prices led to the closure of many badly polluting plants around the world. Fuel and freight costs for synthetic soda ash production have also increased.

Salt costs are also a problem in soda ash production. China is not producing enough to meet its own needs, and manufacturers are looking to develop rock salts as solar salt areas are not available for exploitation. Other factors affecting Chinese soda ash prices are: power shortages, rationing and bottlenecks in transport.

Costs of production are rising in every region but Europe is the highest. The US is cheaper but its shipping costs are higher than China on delivered prices. The threat of US imports holds down European soda ash prices, otherwise imports will rise.

The status of cullet supply in the UK was surveyed by Andy Dawe, materials sector manager, WRAP. Cullet is an increasingly valuable material for the glass industry and WRAP has expanded its remit beyond recycling to include waste reduction, collection and

so on. It has 150 staff providing key programmes such as; ROTATE – advice for local authorities; recycle – TV advertisements that have significantly increased recycling levels; and waste minimisation, a programme to ensure supermarkets are minimising the amount of packaging they consume and sell on, lightweighting and reducing the amount of packaging used; business and finance – raising awareness with investors.

Container cullet has been around for some time with the increasing commonality of bottle banks. WRAP is looking at colour and how it can be changed for easier recycling either by decolourising the glass or changing the expectations of the consumer.

Flat cullet will come from the collection and separation of window waste.

Cathode ray tube (CRT) glass is a very complex material for separation, and the WEEE directive will increase the amount of this glass looking for uses.

In lighting glass, the WEEE and hazardous waste directives have led WRAP to work with Glass Technology Services and the former SLI Glass company to introduce protocols for reintroduction into the lighting production stream.

Glass is 100% recyclable and using cullet in the batch saves energy, cuts emissions, saves quarrying, and reduces landfill. The packaging directive target is to recycle 60% of the glass used in packaging by 2008.

More is being collected than is being reprocessed at present, and there could be a stock problem. In the UK there is a colour imbalance, clear glass is exported as whisky bottles, green is imported as wine bottles.

In some local authorities bottle banks have reached the limit of their impact and kerbside collection is being introduced. In this case there is usually no sorting, mixed glass collected this way will be 60-70% of all the glass collected by 2008.

This has improved the viability of regional colour sorting facilities using automatic sorting technology, but this has a heavy transport imbalance and any residue has still to be moved on so costs increase. Local sorting without transport costs ought to be the best practice.

Where does all the cullet go? A good amount is exported, but there are alternative uses to container production.

Prices need to be right to take the stock levels away and to match supply and demand in the markets.

Potential alternate uses include: brick flux – this is a massive market, the brick industry is high energy users, with the same challenges as the glass industry, glass flux has offered a useful way of reducing energy consumption; pressure filters – glass is a useful material for water filtration in swimming pools, sewage works, etc.; grit blasting – ship builders, Network Rail have used glass grit blasting media; fibre glass – cullet levels are increasing, move to use container glass rather than flat glass; top dressing on golf courses, helps drainage better than sand.

There are 1.4 billion wine bottles imported in green glass if the supermarkets could persuade their suppliers to switch to clear then this would be a great contribution. Another solution would be to bulk import and bottle in green locally. Quinn Glass at Runcorn is following this model with the furnace being integrated with filling lines. This solution uses more green cullet in the UK.

More cullet will be in the supply, the government doesn't want to pay heavy fines to the European Commission for failing to meet its commitment to recycling. Automated colour sorting is needed to cope with the growing proportion of mixed glass colours.

Alternative markets are needed to absorb the residue.

Action needs to be taken to reduce the colour imbalance.

Electronic journals

The refereed papers from *Glass Technology* and *Physics and Chemistry of Glasses* are available through the Internet via the Society of Glass Technology website. This is a new feature and is available to members and non-member subscribers of the journals.

The Society is working with Ingenta, one of the leading hosts of professional and academic publishers on the web, to provide this service. The issues viewable on-line will be from the 1998 volumes onwards. The 2002 volumes onwards will also have links from their references to other on-line publications and reciprocal links will be built up from other electronic journals. This will provide better services for authors and researchers alike, crosslinking the mass of information available.

Since its launch in May 1998, Ingenta has grown to become one of the leading Web infomediaries empowering the exchange of academic and professional content online. With the acquisition of another major provider, Catchword, Ingenta supplies access to: 5400+ full-text online publications, 26,000+ publications.

The IngentaConnect platform was launched in Autumn 2004 and receives up to 12,000,000 users a month. A broad range of content types is made available to users, under subscription and

through a variety of different payment models such as library payment accounts, individual subscription sales and article pay-per-view access. The site offers tools designed to integrate the IngentaConnect platform with popular browsers and search engines such as Firefox and Google. Users can also take advantage of features such as flagged subscriptions, marked lists, reference linking and alerting services.

The title, authors and abstracts of other journals can be viewed on line, and a pay-per-view facility can be offered for anyone wanting full access to the publication.

Members with more than three years service will have full access to the available issues. More recent members will have graduated rights to view the volumes: two years for a new member, an additional two for those renewing for the second year, and full rights for subsequent renewals.

The December 2000 issue of *Glass Technology* and the June 2001 issues of *Physics and Chemistry of Glasses* are freely viewable as sample publications.

For further information either view the links from www.sgt.org or www.ingentaconnect.com/content/sgt/

ESG 2004 Proceedings

Peer reviewed Proceedings of the Seventh ESG, Athens, Greece held on 25–28 April 2004 are published in the April issues of *Glass Technology* and *Physics and Chemistry of Glasses*. *Physics and Chemistry of Glasses* has 208 pages made up from 44 papers. All the papers have been processed through the full refereeing procedure used for standard journal papers.

Glass Technology has 180 pages made up from 38 papers. All the papers have been processed through the full refereeing procedure used for standard journal papers.

A complete bound version of the proceedings, 408 pages, A4, can be bought from the Society of Glass Technology price £100 non-members, £80 members. SGT members choose either *Glass Technology* or *Physics and Chemistry of Glasses* or pay for both. Members will receive the other journal for £30.

Congress papers in print or CD

The *Physics and Chemistry of Glasses* special proceedings volume is now complete. The refereed papers have been passed for publication and the volumes are now available for distribution. There are 97 papers accepted for publication in the volume, totalling 512 pages.

The volume is available for £100, and £50 to members.

The *Glass Technology* International Congress on Glass, special proceedings volume has 80 papers in the volume, totalling 394 pages.

The volume is available for £80, and £40 to members.

Groups of papers can also be ordered from the SGT website, members can pay for sets of four papers for £10, non-members pay £10 for three papers. Once payment is cleared, the papers will be sent by email as Adobe Acrobat files to the customer.

A CD-ROM with Acrobat versions of all the available presentations at the conference can be bought for £35.

History and Heritage of Glass series publication

The History and Heritage Special Interest Group of the Society of Glass Technology has decided to reprint as collections, papers that have previously appeared either in the *Journal of the Society of Glass Technology* or *Glass Technology*. Sometimes the articles will be from a single source, whereas others will be from a number of different authors on the same theme.

Old English Glass Houses is the first of this series, the papers were all researched and written by Francis Buckley and originally published in the *Journal of the Society of Glass Technology* in the 1920s. Buckley has also published some separate books on Old London Glasshouses in 1915 and one solely on glassware, *The History of Old English Glass* in 1925.

Between 1681 and 1703 John Houghton an eminent member of the Royal Society wrote a series of Letters to Parliament which were collected and published later under the general title of "Husbandry and Trade Improvement". In Letter Number 198,

dated 15th May 1696, Houghton listed all the glassworks in England and Wales which were working at that time, around 90 in total, but some double counting may have occurred. It is quite possible that Francis Buckley used Houghton's listing for his research, it is an obvious starting point, most of the glassworks in Houghton's list are mentioned along with many more. There are also glassworks listed for areas not covered by Houghton for example Cumberland and many parts of Yorkshire, there are also some mentioned in Scotland.

Buckley's references to each of his papers contain a rich amount of additional information to that in the main text, charting the rise and fall of companies, the entrepreneurs, their families and, in places, marital disagreements.

Old English Glasshouses by Francis Buckley 242 pages, A5 (210mm x 148mm), ISBN 0-900682-46-9, £20 (£15 SGT full and special interest group members).



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