

# SGT NEWS



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## CONSERVATION OF GLASS ARTEFACTS

The modern conservation of old artefacts is sometimes a damage limitation exercise undoing the work done by well meaning collectors. It also provides an insight into the precision and craft used to make the items in question. Lesley Cowan, Conservation Officer at the Cheshire Museums Service came along to a joint meeting of the SGT's North West Section and the Institute of Materials, North West Ceramics Group at the Pilkington Glass Museum to talk about the deterioration of glass articles and the need for proper conservation methods.

The Cheshire Museums Service has a Conservation Department at the Salt Museum, Northwich which is grant aided by the Museums and Galleries Commission. In addition to its work for Cheshire Museums, the department also conducts commissions to carry out conservation work for collectors in the region and in the rest of the UK. The profession of conservator was formalised in the 1950s from a

movement which began in the 1930s. Today, there are university courses which provide the correct academic and practical grounding to meet employers' requirements.

The purpose of conservation is to make an item look as new as possible. Glass can deteriorate due to its composition, the environment in which it is stored, pollution and sometimes previous conservation techniques. Certain pieces are beyond restoration and many pieces can be broken. The standard method for conserving a piece of glass is to tape it together and then introduce epoxy glue into the cracks, by capillary action. The main principle is to do as little damage to the glass as possible.

When it comes to replacing missing parts from a badly damaged glass item, there is an ethical dilemma for the conservator. The first option is to repair the piece using an obviously false epoxy polyester resin patch, or secondly to take no action at all. Modern restoration work has to be reversible. It must be possible to remove the glue again without affecting the piece. Records are kept of all the conservation work undertaken and the chemicals used.

Some items may only have glass components such as the glass eyes of a doll or Egyptian mummy. What may be an efficient cleaning solvent for one material may be too rigorous for another. Gels made up from different solvents can be used and stress may be caused by using an epoxy glue which is too strong. It is possible to cause more damage through the action of repair, than to leave a damaged piece alone. ■

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### RECYCLING OF REFRACTORIES

In Alloa, in 1995 tipping costs were £15/20 tonnes or 75p/tonne. In 1997 landfill tax is £7/tonne and tipping costs are £6/tonne or £13/tonne. Is there a better route to take to ensure that the responsible glassmaker and refractories supplier can dispose of their waste? What can waste refractories be used for?

The Glass, Batch, Furnace and Refractories Committee will be holding a workshop on recycling refractories at Keresforth Hall, Barnsley on 4 March 1998. The meeting will take the form of a series of short addresses in the morning followed by an open forum to exchange ideas for the recycling of refractory materials in the future.

Further details of the meeting are available from Jill Costello at the Society.

### ELECTRONIC GLASS INFORMATION

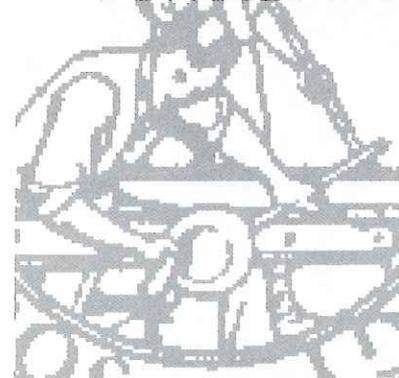
The Special Interest Group on Glass Information is organising a one day meeting on electronic sources of glass information on Wednesday 22 April 1998 at British Glass, Sheffield. The topics covered will be:

- The SciGlass glass properties database;
- Glass on Line, the glass news web site run by the publishers of Glass Machinery Plants & Accessories;
- Glassfile, the on-line scientific literature database based on the International Pool of Abstracts;
- The International Commission on Glass and its approach to communications on the world wide web;
- A review of web pages on glass, including those of the Society of Glass Technology and British Glass.

Further details of the meeting are available from Jill Costello at the Society.



# INDIUM AS A MANUFACTURING TOOL



One of the less common elements used in the glass industry is indium. In a joint meeting with the London Materials Society of the Institute of Materials, the Society of Glass Technology's London Section found out more about the contribution it can make to a range of manufacturing industries. Mark Willey of Indium Europe was the speaker at the Institute's London headquarters and sponsored refreshments after the event.

Indium, no. 49 in the periodic table, is a brilliant, lustrous, silvery-white metal. When added to other metals it increases its tensile strength, ductility and malleability and decreases melting temperature. It is softer than lead and can deform almost indefinitely under compression, even under cryogenic conditions. It was first used widely in gallium doped indium alloys in semiconductor applications. However it is now more widely used in lead free solder, lens blocking, indium tin oxide coatings and bonding non-metallic materials.

Indium was first discovered in 1863 at the Freiberg School of Mines, in Germany by researchers using spectrography to check local zinc ores for thallium. Subsequent work on flue dusts from zinc works in Goslar in Germany yielded the pure metal. It does not occur naturally in concentrated deposits and has the same relative abundance as silver. Commercial production is most often associated with zinc residues, slag, flue dusts and intermediates in zinc and lead smelting.

Indium alloys are used in lens blocking to attach optical lens blanks to surfacing blocks, for grinding the required optical prescription into the lens blank. The advantage of using low temperature alloys of indium is that they conform to any lens configuration, they are cheap, easy to use and recyclable. The two most common alloys for glass lens production are indalloy 117 and 158, with melting temperatures at 117°F and 158°F, respectively. Indalloy 158 has a better bond strength and is used for glass lenses only. The lens can be removed by simply dipping into a bath of hot water. The indium alloy melts and settles at the bottom.

The low melting properties of indium and its alloys make it ideal for dental alloys, proof casting, tube bending, wax pattern dies and punch anchoring.

It can be used with its alloys as a direct replacement of tin-lead solders or as a strengthening agent. It has a greater resistance to thermal fatigue than lead based solders, which has led to its adoption in electronic assemblies. Pure indium, indium-tin and indium-silver alloys will wet glass, quartz, mica and glazed ceramics making them useful for glass to metal seals and for vacuum systems in particular. Since it retains its plasticity down to liquid helium temperatures, it is also used for sealing cryogenic systems.

In glass making indium has many similarities with gallium: similar rare occurrence, an oxidation number of III and

similarity to aluminium.  $\text{In}_2\text{O}_3$  resembles  $\text{Al}_2\text{O}_3$  as it suppresses the tendency to devitrify in amounts as small as 2%. With the introduction of  $\text{In}_2\text{O}_3$  in sulphur-containing glasses of around 1 part – 1000 parts glass, its oxide creates a light yellow to dark amber colour, depending on the glass composition.  $\text{In}_2\text{S}_3$  is present in glass in the form of yellow colloidal particles.

Indium oxide and indium tin oxide (ITO) coatings on glass create conductive, highly transparent surfaces which reflect infrared rays and allow visible and ultraviolet rays to pass through. The coatings are used in a wide variety of applications, such as: solar collector panels (terrestrial and non-terrestrial), photovoltaic cells, low emissivity coatings of window glass, liquid crystal displays and touch sensitive screens, low pressure sodium lamps, and aircraft windshields. Coatings are applied by gas phase hydrolysis, sputtering and chemical vapour deposition, depending on the source material. The coatings are limited to service below 150°C. ■



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## IN PRINT

The February 1998 issues of Glass Technology contains papers on the packaging waste directives and the potential confusion that this will create. It also includes two papers on polishing lead crystal glass, one on recovery of lead compounds from polishing sludges and the other on acid free polishing by cerium oxide chemo-mechanical techniques. Peer reviewed papers cover the effects of sand blasting on the performance of windows; patterns of natural convection driven by the free surface temperature distribution in a glass melting furnace and the optical strength of glasses implanted with argon ions.

The February issue of Physics and Chemistry of Glasses has peer reviewed papers on: micro hardness of alkali silicate glasses with iron; the structure and non-isothermal crystallisation of barium borosilicate system glasses; the structure of sol-gel derived sodium germanate glasses by x-ray diffraction and EXAFS methods; the elastic anelastic and nonlinear acoustic properties of zinc chloride phosphate glasses; alkali fluoroborate glasses;  $\text{H}_2\text{O}_3\text{-Al}_2\text{O}_3\text{-SiO}_2$  glasses for in-vivo radiotherapy; formation and properties of sodium indium silicate glasses; oxidation state of manganese ions in silicate gels and gel derived glasses; magnetisation and XPS studies of the redox state of copper in  $\text{SiO}_2\text{-Na}_2\text{O-CuO}$  glasses; spectroscopic studies of  $\text{Ce}^{3+}$  ion calcium metaphosphate glass; electrical properties of semiconducting barium vanadate glasses containing iron oxide and a communication on the application of matrix algebra to determine oxide factors.

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## XI INTERNATIONAL SYMPOSIUM ON NON-OXIDE GLASSES AND NEW OPTICAL GLASSES

The International Symposium is the premier conference for discussion of the latest developments in synthesis, structure, properties, processing and applications of non-oxide glasses and new optical glasses. Formerly known as the International Symposium on Non-Oxide Glasses, the event has been held about every two years since 1981. Over 100 scientists from 20 different countries are expected to attend the prestigious meeting. An important objective of the symposium is to bridge the gap between scientific understanding and technical requirements, so that the future potential of special glasses, including innovative photonic materials

technologies, is realised effectively. For the first time, the title of the symposium has been extended so that it encompasses special oxide glasses, making the conference a forum for discussion of all types of non-traditional, inorganic glasses.

The event will take place at Tapton Conference Centre, University of Sheffield, from Monday 7 to Thursday 10 September 1998.

Contributed papers are sought in any area of non-oxide glasses and new optical glasses including the following topics:

- Novel glasses and glass systems including halide, chalcogenide, chalcohalide, oxyhalide and special oxide glasses including: tellurite, gallate, phosphate and germanate. Also novel glass ceramics, especially separation of different crystal anionic phases in an amorphous host producing unusual optical properties.
- Glass synthesis including vapour deposition, melting and also non-conventional approaches like sol-gel for non-oxide glasses.
- Glass processing including fabrication of fibres and planar waveguides, use of ionic diffusion and etching/coating methods to achieve refractive index modification in special glasses. Problems associated with processing, for example crystallisation, identification and the elimination of unwanted impurities in glass.
- Glass structure including infrared and Raman spectroscopy, solid state nuclear magnetic spectroscopy, neutron scattering, EXAFS, glass modelling including Monte Carlo simulation.
- Glass physical and chemical properties, including thermal properties like viscosity/temperature behaviour; thermal expansion and stress relaxation; nucleation and crystallisation; mechanical properties and chemical durability; thermodynamics.
- Electronic and ionic properties, for instance, semi-conducting properties of

chalcogenide based glasses; electric field poling to achieve non-linear optical properties; fast ion conduction.

- Optical properties: both linear properties such as transmission, absorption and refractive index and non-linear properties, including 2nd and 3rd order non-linearities in glass; two photon absorption and photoanisotropy.
- Rare earth doping of glasses, for instance, spectroscopy including absorption; emission; up-conversion; excited lifetime measurement; Judd-Ofelt analysis; co-doping.
- Photonic devices including fibre and planar waveguide amplifiers at 1.3mm to 1.6mm, waveguide lasers, all-optical switches, imaging, sensors - especially long-wavelength spectroscopic toxic gas and liquid sensors, medical sensors and devices.
- New directions and applications.

It is a special feature and major advantage of this symposium that there will be no parallel scientific sessions. This is a departure from previous symposia but the decision has been taken by the International Advisory Board. It is believed that a single oral session attended by everyone will successfully lay the foundations for a cross-fertilisation of ideas and invigorating discussion amongst delegates. Spoken contributions will be 15 minutes long, with an additional five minutes for questions. Invited papers will be 40 minutes long including time for questions. The keynote lecture will be one hour.

### INVITED SPEAKERS

The following speakers have agreed to present invited lectures on the indicated topics:

- Keynote Lecture - The Glass Ceiling, D N Payne, Optoelectronics Research Centre, Southampton University (UK).



CONTINUED ►

### LOCAL SECTION CONTACTS

For details of forthcoming local section events in your area, contact the following. All SGT members and non-members welcome.

#### London

- Mr P West, United Glass Ltd, Porters Wood, St Albans, Herts AL3 6NY. Tel 01727 59261.

#### Midlands

- Mr C Baldwin, Stein Atkinson Stordy Ltd, Midland House, Ounsdale Road, Wombourne, Near Wolverhampton WV5 8BY. Tel 01902 324000.

#### North East

- Mr J Henderson, 44 Woodside Ave, Throckley, Newcastle upon Tyne NE15 9BE. Tel 0191 264 4775.

#### North West

- Dr D Martlew, Pilkington Technology Centre, Hall Lane, Latbom, Ormskirk, Lancs. Tel 01695 54210.

#### Scottish

- Mr D A Rennie, United Glass Ltd, Glasshouse Loan, Alloa FK20 1PD. Tel 01259 218822.

#### Yorkshire

- Miss R M Sales, 20 Blackbrook Drive, Sheffield S10 4LS. Tel 0114 2306179.

#### NORTH AMERICA

- Dr A G Clare, School of Ceramic Engineering and Sciences, New York State College of Ceramics at Alfred University, 2 Pine Street, Alfred, NY 4802-1296, USA. Tel 607 871 2392.

#### INDIA

- Dr J Mukerji, Central Glass and Ceramic Research Institute, PO Jadavpur University, Calcutta 777 032, India. Tel 473 3496.

### JUST PUBLISHED

#### RAW MATERIALS FOR GLASS MELTING BY BO SIMMINGSKÖLD

A practical guide on raw materials used in glass melting to those concerned with batch handling, glass melting, glass compositions and the purchase of raw materials. Contents include: materials index, raw material description, conversion factors for common raw materials, batch calculations and examples of colorant combinations for coloured glasses. 80 pages. ISBN 0 900682 24 8.

Members price (SGT and members of all participants in the ESG) £12.50. Non-members price £22.50.

#### BORATE GLASSES, CRYSTALS AND MELTS

Proceedings of the Second International Conference on Borates Glasses, Crystals and Melts held at The Cosener's House, Abingdon, UK from 22-25 July 1996. 64 papers, 570 pages including index. Edited by Adrian C Wright, Steven A Feller and Alex C Hannon. ISBN 0 900682 23 X. Members price (SGT and members of all participants in the ESG) £50.00. Non-members price £60.00.

- Quantitative NMR studies of the local structure in chalcogenide glasses. H Eckert, Institut für Physikalische Chemie, Westfälische Wilhelms University (Germany).
- Fabrication of glass based optical amplifiers for telecommunication applications. A J Faber, TNO Institute of Applied Physics, Eindhoven (The Netherlands).
- Crystallisation dynamics of chalcogenide glass thin films under extra non-equilibrium conditions. Fuxi Gan, Shanghai Institute of Optics and Fine Mechanics (China).
- Non-silica glass fibre amplifiers. T Kanamori, NTT-Nippon Telegraph and Telephone Corporation (Japan).
- Structure and dynamics of fast ion conducting chalcogenide glasses. S W

Martin, Iowa State University of Science and Technology (USA).

- Spectroscopy and applications of low phonon energy glasses doped with rare earth ions. RS Quimby, Department of Physics, Worcester Polytechnic Institute (USA).
- Active and passive chalcogenide glass optical fibres for IR sensing. J Sanghera, Naval Research Laboratories, Washington (USA).
- Ultra-transparent glass-ceramics, a photonic material for the 21st century. P Tick, Corning Incorporated (USA).
- Photo-induced effects in rare-earth doped and undoped chalcogenide glasses. V Tikhomirov, School of Materials, University of Leeds (UK).
- Studies of optical non-linearities of chalcogenide and heavy metal oxide



glasses. F Wise, Department of Applied Physics, Cornell University (USA).

Young researchers (aged 40 years, or under, on 31 December 1998) are particularly encouraged to apply. There will be a symposium prize for an outstanding contribution to the field. Nominations should be accompanied by a full curriculum vitae and a supporting statement by the nominators, to include the professional relationship between the nominator and nominee. The deadline for receipt of nominations is 1 August 1998.

Further details on the meeting can be obtained from Jill Costello at the Society. ■

## THE WORSHIPFUL COMPANY OF GLASS SELLERS OF LONDON 1998 AWARD FOR ART AND CRAFT

In 1674 George Ravenscroft, under the patronage of the Glass Sellers' Company, effected a process for the manufacture of lead-crystal glass. Manufacture subsequently commenced in a glass house situated where the Savoy Hotel now stands. The Glass Sellers' Company has patronised the art and craft of glass continuously and has consolidated its patronage in the form of the Worshipful Company of Glass Sellers of London Award.

The successful submission will be predominantly of glass, excluding stained glass windows, will have been created within two years of the entry date and will be considered by the judges to be of a high enough standard to merit the award which will be a

trophy and a cash sum of one thousand pounds.

### STUDENT AWARD

The Glass Sellers wished to extend their patronage in the encouragement of young artists and craftsmen in glass at the beginning of their careers. In 1994, they therefore inaugurated a new bi-annual award for artistic and technical excellence in the art and craft of glass.

Entrants must be under 30 years of age at the date of notice of the award, studying at art school or college prior to graduation, or within three years of graduating. As with the main award, entries must be predominantly of glass, excluding stained glass windows. The award will take the form of a cash prize of five hundred pounds and a trophy.

The award alternates every two years with an award for outstanding technical progress. The 1997 title was recently given to Dr George Mattocks, FSGT in recognition of his 'synthetic air' regenerative furnace design which has been adopted and developed by Frazier Simplex, in the United States.

The 1996 winners of the Arts and Craft Awards were Gail Gill in the main category and Belinda Hornsey in the student category.

Entries for these awards are now invited from persons resident in the UK and must be submitted by 31 May 1998. Entrants may not submit pieces for both awards.

Entry forms are available from the Society. ■

### PERSONAL CHAIR FOR ADRIAN WRIGHT

The University of Reading has conferred on Adrian Wright the personal title of Professor of Amorphous Solid State Physics. Adrian is a Fellow of the Society and is an active member of the Basic Science and Technology Committee. Professor Wright was co-chairman and editor of the proceedings of the Borates Glasses, Crystals and Melts conference, held in 1996. He was recently successful in bidding for the Society to hold the Eighth Structure of Non-Crystalline Materials conference in 2000 at the University of Aberystwyth.



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### SGT MEMBERS ACCESS TO ST GEORGE'S LIBRARY

Members can come to the Library to simply browse or to look for something specific. If they want to borrow any books or journals\* from the library they can obtain an external borrowers ticket by filling in a form and showing their SGT Membership card. External borrowers can take up to five items at any time for three weeks. The external borrower ticket is valid for one year.

If members cannot get to the Library but know which book or journal they want to borrow, this can be requested via the SGT or through Mary Parker, the Society librarian at St George's. The book, if available, will be posted to them. Books are on loan for three weeks only, including postage time.

STAR, the University of Sheffield's catalogue of all books and journals, can be accessed via the internet either through the link at the Society's web site (<http://www.sgt.org/library>).

Library opening times (during term time):

Monday-Thursday	9.00am-9.30pm
Friday	10.00am-5.00pm
Saturday	9.00am-5.00pm
Sunday	2.00pm-6.00pm

Out of term time the library is open from 9.00am to 5.00pm from Monday to Friday.

Mary Parker is in the Library on Monday, Wednesday and Thursday mornings. Direct dial +44(0)114 222 7307.

\* Some books are only available for short loan (overnight or one week only). It is not feasible to post these to borrowers.

If a book is not in the Library, an inter-library loan can be requested. There is a charge of £7.50 for this service.