

SGT NEWS



Compiled and published by DMG Business Media Ltd on behalf of the Society of Glass Technology

PHOTONS, GLASSES AND COATINGS

Glass surfaces provide a unique point of contact for chemical reactions and physical phenomena allowing new applications to be exploited in isolation of the glass or in conjunction with it. The Society of Glass Technology and the Solid State Chemistry group of the Royal Society of Chemistry held a joint meeting on the interaction of photons, glasses and coatings at Pilkington Technology Centre, Lathom on 28 April 1999. The meeting was attended by a mix of academics and industrialists from the UK, Germany and Ireland. The day included seven papers providing an overview of the major research activities as well as 28 posters on the very latest research being undertaken.

The delegates for the meeting were greeted by Dr Ted Ellis of Pilkington Technology Centre, the hosts for the event. He outlined the importance of the understanding of the glass surface and its interaction with coatings which had led to the development of many new value added products from both Pilkington and the glass industry as a whole. Future research will underpin identification of new applications and technologies.

Dr John Parker of the Centre for Glass Research at the University of Sheffield presented the first paper on the application of heavy metal fluoride glass scintillators for particle physics experiments. These experiments planned at CERN involve very high energy collisions between sub-atomic particles. The resulting output is monitored by a range of detectors, one of which is an electromagnetic calorimeter.

This integrates the energy of the radiation emitted as a result of the collisions by producing scintillation light output in the UV which is proportional to the energy input. To do this quantitatively, all of the input energy must be absorbed and this in turn requires a large detector, typically 50cm-100cm thick. Fluoride glasses have proved to be one candidate material for this application, having sufficient density to absorb the input radiation efficiently, giving an adequate scintillation yield and having the fast response time needed to match the time interval between events. They are also sufficiently transparent in the UV to allow transmission of the scintillation radiation over the required distances. Dr Parker's paper discussed the development of these materials and, in particular, the difficulties.

Making and shaping glasses in optoelectronics was summarised by Dr Angela Seddon of the Centre for Glass Research at the University of Sheffield. This paper reviewed recent progress in development of Ga-La-S glasses for photonic waveguides. Ga-La-S glasses are composed of a more weakly bound lattice than the silica glasses used for current waveguide applications. The weaker chemical bonding leads to greater optical versatility than silica, but lowered stability towards devitrification. It was necessary to carry out a fundamental re-examination of the



President:
John F B Clark,
FSGT.

Honorary Secretary:
Mr W Simpson,
FIMgt, FIM, FSGT.

Honorary Treasurer:
Mr R T
Montgomery, CA,
FSGT.

8TH INTERNATIONAL CONFERENCE

NCM8 is the eighth in a series of international conferences devoted to the structure of non-crystalline, quasi-crystalline and nano-materials. The first two conferences (1976 and 1982) were held at Churchill College, Cambridge, under the auspices of the Society of Glass Technology (SGT). They were followed by events in Grenoble (1985), Oxnard (1988), Sendai (1991), Prague (1994) and Chia (Sardinia, 1997). For the year 2000, NCM8 will return to the UK and again be organised under the auspices of the SGT. The conference will be hosted by the University of Wales, Aberystwyth.

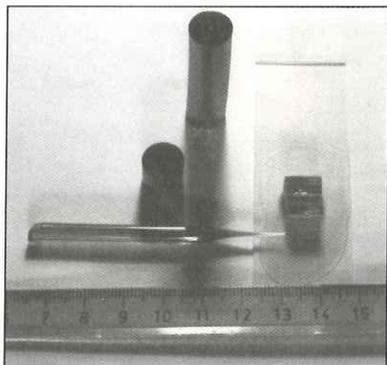
Professor Adrian C Wright of the J J Thomson Physical Laboratory, University of Reading and Professor G Neville Greaves of the Department of Physics, University of Wales, Aberystwyth will co-chair the conference.

PROCEEDINGS

Papers will be accepted for presentation at the conference on the condition that a manuscript is submitted for publication in the proceedings, which will take the form of a hard-bound volume, included in a normal journal series. The editors will be A C Wright and G N Greaves and the deadline for the submission of manuscripts is 5 June 2000.

A second announcement and call for papers will be mailed early in 2000. The abstract deadline will be 13 March 2000.

CONTINUED ►



Making and shaping glasses in optoelectronics.

crystallisation behaviour of Ga-La-S glasses. From this knowledge, Dr Seddon, Mr Furniss and Mr Li are developing an extrusion technique for shaping Ga-La-S fibre optic preforms.

Following the lunchtime poster session, Professor Andrew Mills of the department of chemistry, University of Wales, Swansea presented an overview of nanocrystalline semiconductor-on-glass photocatalysis. This includes the use of semiconductors especially TiO_2 for sensitising; the dissociation of water; extraction of metal ions; mineralisation of dissolved and volatile organic pollutants by oxygen; killing of biological cells and photodemisting; and photo-self-cleaning effects. The features of the currently favoured semiconductor photocatalyst material, namely nanocrystalline, non-scattering TiO_2 are discussed and compared with those of a conventional TiO_2 powder photocatalyst.

Professor Laurie Peters of the department of chemistry, University of Bath described investigations into the character of TiO_2 film on tin oxide coated glass for photovoltaic applications. The electrochemistry group at Bath is actively looking at fabrication and characterisation of solar cells, using chemical and electrochemical deposition methods, characterisation of thin film solar cell components using spectroscopic and electrical methods, electrodeposition of semiconductors on single crystal substrates, scanning tunnelling and atomic force microscopy of surfaces, and the kinetics and mechanisms of light stimulated reactions at the semiconductor/electrolyte interface.

The application of photocatalytic TiO_2 coatings on glass was described by Dr Detlef

Bahnemann of the Institut für Solarenergieforschung GmbH, Hannover, Germany.

Photocatalysis employing titanium dioxide (TiO_2) as the light-absorbing catalyst has been discussed as a feasible means of both detoxification and disinfection of aqueous and gaseous systems for more than ten years now. While the catalyst is employed in its particulate form in most of the current applications of this technology, it is of considerable economic importance to realise a durable adhesion of the material on surfaces possessing chemical properties similar to TiO_2 , such as glass. A thin film fixed bed reactor has been developed using glass plates coated with the most active commercially available photocatalysts. Results were presented for the degradation of model pollutants in aqueous solutions as well as for real waste waters. A pilot plant is currently under construction for the solar photocatalytic treatment of industrial waste water from the textile industry. Titanium dioxide nanoparticles can be employed to coat glass panes, resulting in optically transparent layers of the photocatalyst. The activity of these systems has been studied, using fatty acids as model compounds resembling typical compounds responsible for soiling glass surfaces exposed to realistic environmental conditions. The perspectives of this so-called self-cleaning glass were also discussed in detail.

Following a break for tea and a second viewing of the posters, Professor Michael Hitchman of the department of pure and applied chemistry at University of Strathclyde described the chemical vapour deposition, growth and characterisation of TiO_2 films on glass. The CVD films were characterised by a range of techniques and their use for the photoelectrochemical destruction of organic compounds investigated. It was shown that photoelectrochemical activity is strongly dependent upon the anatase content of the films, with the activity decreasing as the anatase level falls and the rutile level rises. However, although rutile does not appear to be a useful form of titanium dioxide for photoelectrochemical applications, it does have important uses as a high refractive index material and a high quality dielectric. Other results



presented described the preparation of the rutile form of titanium dioxide by CVD at temperatures significantly lower than those previously reported. It was shown that pure rutile films can be grown on a range of substrates, including glass, at temperatures as low as 300°C .

The final presentation of the meeting was by Professor Michael Bowker of the department of chemistry, Reading University. His presentation was titled *Skating on thin ice: high temperature scanning tunnelling microscopy observations of the oxidation and reconstruction of reduced TiO_2 (110) at high resolution*. Scanning tunnelling microscopy has revolutionised the understanding of surface structure it has been applied by many laboratories in recent years, even though it was invented only 15 years ago and has only recently been commercialised. The Reading group has applied this technique to the help understand the way that reactions take place at surfaces, especially in identifying the active site for particular catalytic reactions and, in this case, the (110) crystallographic plane in TiO_2 .

SUPPORT FOR STUDENTS

As a special concession to research students, the Society of Glass Technology made provision for a 'two for one' scheme allowing attendees of both the New Researchers Forum on Glass and the meeting to pay for only one registration. The Society and the organising committees are always open to suggestions for other ways of promoting greater participation in its meetings.

TOPICAL ISSUES IN GLASS

The proceedings of the Photons, Glasses and Coatings meeting will be published in Volume 3 of *Topical Issues in Glass*. The expected publication date for the seven papers and 28 posters will be Monday, 2 August 1999. The cost of the proceedings will be £15 to members of the participating organisations (Society of Glass Technology and the Royal Society of Chemistry) and £25 to non-members. ■



Society of Glass
Technology,
3rd Floor,
Don Valley House,
Savile Street East,
Sheffield S4 7UQ.
Tel 0114 263 4455.
Fax 0114 263 4411.

SGT NEWS

INTERNATIONAL CONGRESS ON GLASS

The International Commission on Glass was formed in 1933 to promote international collaboration and to disseminate information widely throughout the glass community. One way of achieving this has been to sponsor a triennial International Glass Congress. The Society of Glass Technology last brought this congress to Britain in 1968 and has been successful in its bid to stage the congress in Edinburgh from 2 - 6 July 2001. In the interim it has been held in places as diverse as St Petersburg, Madrid, Beijing and most recently San Francisco. This last event attracted over 850 participants from 48 countries. The congress is always attended by a wide range of scientists and industrialists and the Society of Glass Technology will be extending this by working with other glass related societies in the UK to build a multidisciplinary event for anyone interested in glass.

LOCATION

The congress will be held at the Edinburgh International Conference Centre, situated close to the heart of the historical capital of Scotland. The city is renowned for its unique past, heritage, architecture and cultural vibrance. It is home to a world famous castle and the Royal Palace of Holyroodhouse, so closely associated with Mary Queen of Scots. It hosts the world renowned Edinburgh International Festival and Military Tattoo. The city, containing three universities, is a traditional seat of learning. Accompanying persons and off-duty delegates can visit the castle, walk along the Royal Mile, climb Arthur's Seat for a bird's eye view, travel down the old city's cobbled streets or simply shop for



speciality items such as tartans and whisky. The Royal Yacht Britannia is also moored nearby.

International visitors can fly into Heathrow or Gatwick and take a shuttle flight to Edinburgh Airport. The conference centre offers a range of facilities, which will allow parallel sessions or plenary events with up to 1200 participants. A full range of audio-visual equipment will be provided.

MAIN THEMES FOR THE CONGRESS

The main congress theme encompasses new directions for glass developments and applications. In addition to the normal topics, such as glass structure, properties, technology and manufacturing, specific topics are planned on:

- The glass industry and the environment.
- Glasses for optoelectronics and telecommunications.

- Waste vitrification and glass encapsulation.
- Optical glasses: science and technology.
- Glass art and design.
- Glass education.
- Relationship between glass structure and properties.
- Computer simulation in glass science and technology.
- Novel glasses and applications.
- Glass archaeology and archaeometry.
- Glass surfaces and coatings.
- Phase separation and devitrification.

Apart from plenary lectures of general interest, the congress will be run as parallel sessions, introduced by invited lectures from eminent international glass scientists and technologists. Some topics, particularly those



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 Sturdy 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, Lathom, 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.

involving art and archaeology, will be run as one day sessions, allowing restricted registration and attendance for a specific subject area. Two poster sessions will follow similar themes to those listed above. The official language of the congress will be English.

EXHIBITIONS

The various ICG Technical Committees will have posters on display throughout the Congress, providing detailed information on their activities. Companies or individuals wishing to exhibit their products or to advertise particular services should in the first instance contact the congress secretariat. Organisations or institutions are especially invited to sponsor specific events during the congress and those interested should again contact the congress secretariat.

SIGNIFICANT DATES

Preliminary registration, 1 February 2000; second announcement and call for papers, 1 April 2000; abstracts, 1 September 2000; notification of acceptance, 1 December 2000; registration, 1 March 2001; receipt of manuscripts, 1 March 2001.

NEW EDITOR OF PHYSICS AND CHEMISTRY OF GLASSES

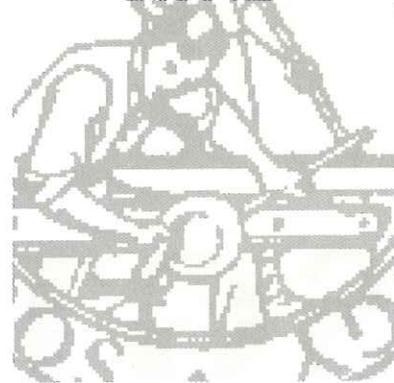
Professor Malcolm D Ingram of the department of chemistry, University of Aberdeen has taken on the role of editor of Physics and Chemistry of Glasses. Professor Ingram is looking to work with authors and referees to build on the excellent reputation established by Professor Alan Owen until his death earlier this year.

Professor Ingram's research interests at Aberdeen include ion conducting polymers for use in electrochemical storage devices and ionic conducting glasses. According to the 'dynamic structure model' of Ingram et al ions are able to create their own pathways and are thus able to migrate in the solid phases apparently independently of the relaxation of the host material. This is the origin of the phenomenon known as 'decoupling'. His research work includes collaboration with partners around the world.

ANCIENT GLASS AND MODERN SCIENCE - BUILDING ON THE LEGACY OF W E S TURNER

The 13th Turner Memorial Lecture will be presented by Dr Ian Freestone, deputy keeper of scientific research, British Museum, London. It will be presented in the St George's Church lecture theatre at the University of Sheffield on Thursday 30 September. The lecture, on the use of modern scientific tools to study ancient glasses, will be presented at 6.15pm and is to be preceded by a reception at 5.30pm for all attending.

Ian Freestone is a geochemist and mineralogist who joined the British Museum in 1979, following post-doctoral work on silicate phase equilibria at high temperatures, pressures and controlled oxygen partial pressures at the University of Manchester. He is currently deputy keeper of the Department of Scientific Research of the museum which includes a group of 15 scientists who carry out science based research in collaboration with the museum's curators as well as research programmes in their own fields of interest. His interest is in particular the nature of production in the past. He



specialises in the interpretation of early non-metallic materials and focuses on technology and provenance.

Current work includes the development of the glass industries after the Roman period and also the porcelain industry in eighteenth century Britain. He is leading the development of the application of the laser Raman microprobe to examine objects in the British Museum. Projects have involved glass and ceramics from a wide range of cultures and periods, including work on the Portland Vase; the Lycurgus Cup, medieval enamels; Islamic enamelled glass; Venetian coloured glass and enamel; the great glass slab at Beth Shearim, Israel; English 18th century porcelain technology; Chinese porcelain technology; Iron Age ceramic production; early refractory materials; early zinc smelting. The lecture will be published in a future issue of Glass Technology. ■

IN PRINT

The August issue of Glass Technology has papers from the Society of Glass Technology's meeting, Glass Opportunities - from feeder to cold end. The issue also contains peer reviewed papers on: Spectroscopic techniques for the determination of the iron redox state of glass and their direct application in the glass plant; A new measurement method of thermal dimensional stability of glass and its application to LCD substrates; Role of helium in fluorine incorporation for control of preform entry taper; and Parametric studies of a steady state continuous glass furnace.

The August issue of Physics and Chemistry of Glasses has the following papers: Interaction of manganese with interface sites in silica aerogels and partially densified aerogels; Thermal, physical and spectroscopic investigations of $P_2O_5-A_2MoO_4-A_2O$ ($A=Li, Na$) glasses; Infrared spectra, band frequencies and structure of sodium germanate glasses; Glass forming tendency and thermal properties of chalcogenide glass; Evaluation of spectral parameters of Nd^{3+} ion in borate glasses - Judd-Ofelt parameters; Preparation and optical properties of transparent tellurite based glass ceramics doped by Er^{3+} and Eu^{3+} ; Formation and properties of gadolinium aluminoborate glasses; Thermodynamic activity of nickel oxide in alkali nickel silicate glasses; Compositional dependence of Judd-Ofelt parameters of Er^{3+} in borosilicate glasses; and Infrared spectra of hydrogen bonded hydroxyl groups in silicate glasses - a re-interpretation.



Compiled and published by DMG Business Media Ltd on behalf of the Society of Glass Technology