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SGT NEWS

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COATINGS ON GLASS

The ICG 2001 Glass Technology proceedings volume has several papers looking at coatings on glass, the different coating techniques and the effects that can be produced by them.

Sputtering and vacuum evaporation deposition processes allow the deposition of multiple SiO_2/TiO_2 layers on a flat substrate (generally glass) for obtaining optical coatings with good homogeneity and high chemical and mechanical resistance. By increasing the number of SiO_2/TiO_2 layers and optimising the layer thicknesses by suitable computing codes based on the Fresnel laws, the Italian group of researchers G Battaglin, A Menelle, M Montecchi, E Nichelatti and P Polato were able to tailor spectral transmittance and reflectance curves in the 300-2500 nm range according to the requirements of the specific application. Rutherford back scattering and spectrophotometry were used in this work as complementary techniques to achieve a quite complete and accurate characterisation of optical coatings of commercial production based on SiO_2/TiO_2 layers. A good correlation was found between the evaluations of the layer thicknesses obtained with the two techniques. As usual for other kinds of coatings (e.g. coatings for building applications), the authors tried to use neutron reflectometry for obtaining supplementary information (roughness at the interfaces of the layers, etc.) but the SiO_2 and TiO_2 layers resulted in being too thick for the sensitivity of this technique: the fringe overdamping makes neutron reflectivity spectra not useful for a further analysis of the coatings. Finally, a comparison was performed with the results previously obtained regarding multiple SiO_2/TiO_2 layers for building applications.

Special glasses from the system Li_2O-Al_2O_3-SiO_2 are microstructurable by an ultraviolet lithographic process. By using a standard process A Harnisch, D Hülsenberg, S Hecht-Mijic, S Mrotzek and U Brokmann of Technische Universität Ilmenau in Germany were able to prepare 2D through structures in a glass wafer. Another exposure technique allows a 3D etching process in photosensitive glass. It is also possible to use excimer laser radiation for the exposure. The integration of additional functional properties into the glass components is a special research objective at the department. Technologies for joining the microstructured glasses completes the complex technology.

Silica and titania films were prepared from solution by spin coating by H Kozuka, S Takenaka, S Kimura, T Haruki and Y Ishikawa of Kansai University, Japan. The radiative striations formed on the films were quantitatively evaluated by surface roughness measurements. The thickness and striations were not affected by the amount of sol dispensed on the rotating substrate. The striations were found to increase in height and slightly in spacing with increasing sol viscosity, and to decrease both in height and spacing with increasing spinning rate. In other words, the striation increased in height and spacing with increasing film thickness. Microscopic observation revealed that cell-like patterns are formed near the spinning centre which changed into chain-like patterns and striations away from the spinning centre. Titania gel films were also prepared just by placing a drop of sol on a stationary glass substrate, where cell-like patterns and striations were formed near the spinning centre and away from the centre respectively, as in the case of spin coating films. This result strongly suggests that the substrate rotation is not a necessary condition for evolution of striations. In situ observation on a titania sol layer dispensed on a stationary substrate indicated that the cell-like patterns near the centre and striation-like patterns away from the centre appear to be formed almost simultaneously on solvent evaporation.

The interest in antireflective coatings applied onto large area glass components increases everyday for potential applications such as buildings or shop windows. Because of the use of large size components, the sol-gel process is a competitive way of mass producing antireflective coatings. The dip coating technique commonly used for liquid deposition

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implies a safety hazard due to coating solution handling and storage in the case of large amounts of highly flammable solvent use. On the other hand, spincoating is a liquid low consumption technique. Mainly devoted to coat circular small size substrate, P Prene, P Belleville, F Mennechez and C Bouigeon of Sovis Optique, France, have developed a spin coating machine able to coat large size rectangular windows (up to 1x1.7m^2). Both solutions and coating conditions have been optimised to deposit optical layers with accurate and uniform thickness and to highly limit the edge effects. Experimental single layer antireflective coating deposition process onto large area shielding windows (1000x1700x20mm^3) is described. Results show that the developed process could produce low specular reflection value (down to 1% one side) onto white glass windows over the visible range (460-750nm). Low temperature curing process (120°C) used after sol-gel deposition enables antireflective coating to withstand abrasion resistance properties in compliance to US-MIL-C-0675C moderate test.

Superhydrophobic-superhydrophilic micropattern was formed by irradiation of ultraviolet light on the superhydrophobic coating film which consists of three layers: a flowerlike Al_2O_3 gel film as an underlayer, a very thin TiO_2 gel layer as the second layer and a hydrolysed fluoroalkyltrimethoxysilane layer as the top layer. Aqueous silica sol prepared from colloidal silica, poly(ethylene glycol) and hydrolysed tetramethoxysilane was coated on the superhydrophobic-superhydrophilic micropattern. After heat treatment at 150°C, convexly shaped silica micropatterns were formed on the superhydrophilic region of the pattern. According to K Tadanaga, J Morinaga, T Fujii, A Matsuda and T Minami of Osaka Prefecture University in Japan, this patterning technique has a wide variety of applications such as fabrication of micro-optical components and micropatterned oxide thin films.

The *Glass Technology* special proceedings volume is now complete. The refereed papers have been passed for publication and the volumes are now available for distribution. There are 80 papers accepted for publication in the volume, totalling 394 pages.

The volume is available for £80.00, or £40.00 to members. Groups of papers can also be ordered from the SGT website; members can pay for sets of four papers for £10.00, non-members pay £10.00 for three papers. Once payment is cleared, the papers will be sent by email as Adobe Acrobat files to the customer. The contents pages can be viewed on the website.

For further information, contact david@sgt.org or visit the Society web site: www.sgt.org ■

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STANDARD SAMPLES

The Analysis & Properties Committee of the Society of Glass Technology has completed their analysis of two certified reference materials (CRM) for amber and green coloured glasses. The standard samples were approved by the Council of the Society of Glass Technology in November 2000. The laboratories involved in the process have all followed ISO guidelines for the production and traceability of analytical data.

INTENDED USE AND STABILITY

The samples are available in the form of glass pieces and also as 40mm diameter discs.

They are intended for the verification of analytical methods, such as those used by the participating laboratories, for the calibration of analytical instruments in cases where the calibration of primary substances (pure stoichiometric compounds) is not possible and for establishing secondary reference materials.

The solid disc is intended for establishing and checking the calibration of x-ray spectrometers for the analysis of similar materials. The "as received" surface should be ground and polished.

The traceability of this CRM is ensured by the use of either stoichiometric analytical techniques or methods that are calibrated against pure compounds.

There are also values for ZrO_2 and Mn_3O_4.

These add to the existing range of standard sand and glass samples for analysis and calibration purposes.

GLASSES

***Standard Glass No. 4:* Fluoride Opal Glass**
(Also available as 6 mm thick sheets to special order, price on application.)
***Standard Glass No. 5:* Soda-Lime-Magnesia-Silica Glass**
***Standard Glass No. 6:* Soda-Lime-Silica Glass**
***Standard Glass No. 7:* Soda-Lime-Silica Glass**
Two lead glasses were received by the Analysis & Properties Committee but because of time limitations Glass No. 9 was not analysed by all of the collaborating laboratories. This glass has a lower lead oxide content, about 28% PbO, than Glass No. 8 and although it cannot be offered as a certified material, it could be useful as a subsidiary calibration check.
***Standard Glass No. 8:* Lead oxide-potassium oxide-silica glass (30.59 wt% PbO)**
***Standard Glass No. 9:* Probable composition available.**

SANDS

***Standard Sand No. 1:* 200 g packs at £20.00 plus postage (Al_2O_3 0.061, Fe_2O_3 0.014, TiO_2 0.026)**
***Standard Sand No. 6:* (Al_2O_3 0.06, Fe_2O_3 0.032, TiO_2 0.024)**
***Standard Sand No. 8:* (Al_2O_3 2.07, Fe_2O_3 0.26, TiO_2 0.073, K_2O 1.06)**
***Standard Sand No. 9:* (Al_2O_3 1.35, Fe_2O_3 0.103, TiO_2 0.044, K_2O 0.82).** ■

SGT10 Amber soda-lime-silica container glass (mass%)

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	BaO	Na_2O	K_2O	TiO_2	SO_3	Cr_2O_3
72.8	1.62	0.325	10.6-	1.82	0.02	12.2	0.35	0.09	0.05	0.020

SGT11 Green soda-lime-silica container glass (mass%)

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	BaO	Na_2O	K_2O	TiO_2	SO_3	Cr_2O_3
70.7	1.83	0.342	10.3	2.14	0.031	13.6	0.69	0.068	0.06	0.205

SGT NEWS

CRYSTALLISATION 2003

The *Seventh International Symposium on Crystallisation in Glasses and Liquids* is a major conference with a long tradition. Symposia were held in the United States in 1960, 1971, 1981 and 1992, in Brazil in 1996 and in Liechtenstein in 2000. Recently, meetings have become more frequent with the growing interest in both the basic processes of nucleation and crystal growth in glasses and liquids and the formation and properties of glass-ceramics, materials made by the controlled crystallisation of glasses. Since the pioneering work in the 1950s by S D Stookey, a wide range of applications including kitchenware, dinnerware, telescope mirrors and biomaterials, utilising properties such as ultra-low expansion, high fracture toughness and mechanical machineability have been found. An important objective of the Symposium is to bridge the gap between the scientific understanding of nucleation and growth in glasses and the industrial applications of glass-ceramics.

The University of Sheffield has a long history of research in glass, having founded the first Department of Glass Technology in 1915, and continues to have strong interests in glass and glass-ceramic research. The use of glass-ceramics as biomaterials for clinical applications in medicine and dentistry is of increasing interest to academics in the medical and engineering faculties, reflecting the activity worldwide.

Sunday starts with registration of delegates followed by a reception at 6.00 pm for all delegates at Tapton Hall of Residence.

Monday 7 July begins with the opening ceremony at 8.30 am and then the opening session. This is dedicated to the memory of Professor Michael Weinberg of Arizona State University. The speakers are:

■ *Glass-forming ability versus glass stability parameters* by Professor Edgar Zanotto of Federal University of São Carlos, Brazil;

■ *Crystal nucleation and configurational entropy of silicate glasses* by Professor Joachim Deubener of Technische Universität Clausthal, Germany;

■ *Theory of time-dependent nucleation with applications to crystallisation in glasses* by Dr Vitaly Shneidman, New Jersey Institute of Technology, USA.

The conference continues for the next three days and includes sessions on:

◆ theory and modelling
◆ experimental studies
◆ commercial systems
◆ optical and electrical systems
◆ crystallisation in crystalline waste forms
◆ bioceramics and glasses and crystallisation in metallic glasses.

There is also a poster session for the duration of the conference.

Speakers include:

● Professor Kenneth Kelton of Washington University
● Dr Juergen Horbach of Johannes Gutenberg-Universitaet Mainz
● Dr Carlos Queiroz of University of Aveiro
● Dr Rudi Winter of University of Wales
● Professor L A Bugaev of Rostov State University
● Professor Wolfgang Pannhorst of Schott Glas
● Dr Linda Pinckney of Corning
● Professor Bill Lee of University of Sheffield
● Professor Takayuki Komatsu of Nagaoka University of Technology
● Dr Diane Holland of Warwick University
● Mr Marco Beggiora of University of Sheffield
● Dr Olga Shilova of Institute of Silicate Chemistry of Russian Academy of Sciences
● Dr Ralf Müller of Bundesanstalt für Materialforschung und -prüfung
● Professor Leszek Stoch of University of Mining and Metallurgy
● Professor Wolfram Höland of Ivoclar Vivadent.

Papers will be refereed and those accepted will be published as special issues of the Society of Glass Technology journals *Physics and Chemistry of Glasses* and *Glass Technology* in early 2004.

Workshop administrator and enquiries to: Sara Lindley, Society of Glass Technology, Don Valley House, Savile Street East, Sheffield, S4 7UQ, UK. Tel: +44 (0)114 263 4455. Fax: +44 (0)114 263 4411. Email: sara@glass.demon.co.uk ■

JOURNAL OF THE SOCIETY OF GLASS TECHNOLOGY

The Journal was published by the Society until 1959 when it was split into parts A and B: *Glass Technology* and *Physics and Chemistry of Glasses*. The 1952 volume of JSGT can be viewed from the Society of Glass Technology website.

The contents pages of all the volumes from 1917 have been scanned and will shortly be available to view on the SGT web site. Copies of papers will then be available to order.

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 M Holden, BH-F (Engineering) Ltd, 4A Churchward, Southmead Park, Didcot, Oxon OX11 7HB. Tel 01235 517202.

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– Mr R Nickels, 4 Boundary Way, Compton, Wolverhampton, West Midlands WV6 8DL. Tel 01902 762070.

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– 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.

ELECTRONIC JOURNALS

The refereed papers from *Glass Technology* and *Physics and Chemistry of Glasses* are available over the internet via the Society of Glass Technology website. This is a new feature and is available to members and non-member subscribers to the journals. The Society is working with Ingenta, the leading host of professional and academic publishers on the web, to provide this service. The issues available online will be from the 1998 volumes onwards. The 2002 volumes onwards will also have hyperlinks from their references to other online 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 the leading web infomediary 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 and 26,000+ other publications. The company serves a growing global audience of academic and professional publishers, over 10,000 academic, research and corporate libraries and institutions, incorporating 25 million users worldwide. It records around 3 million monthly user sessions.

The title, authors and abstracts of other journals can be viewed online, 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.ingenta.com ■

THE ART OF GLASS

Professor Michael Cable has edited a new collected volume including the renowned translation by Christopher Merrett of L'Arte Vetraria by Antonio Neri. Merrett translated the Italian's book in 1662, adding his own observations which were almost as long as the original text. "The world's most famous book on glassmaking" was then quickly translated into Latin, German, French and Spanish and was used as a reference source for glassmakers for the next 100 years.

To mark the book's 300th year, Professor W E S Turner read a paper to the 1962 Annual General Meeting titled 'A notable British seventeenth-century contribution to the literature of glassmaking', later published in Glass Technology. This has been included in the volume as well as a preface by the Editor.

The volume reproduces the original layout of The Art of Glass on an A5 format.

A5 (210 mm x 148 mm), 436 pages, ISBN 0-900682-26-4. Paperback. Fourth print. £17.50 (£15.00 SGT members & ICG affiliate members + £3.00 postage).

COLOURED GLASSES BY W A WEYL

The constitution of coloured glasses, the colours of glasses produced by various colouring ions and other additions are explained in this classic work. In addition, fluorescence, thermoluminescence and solarisation are also described.

1951 (fifth reprint 1999), 216 mm x 137 mm, 558 pages, black and white illustrations, ISBN 0-900683-06-X; £35.00 (£30.00 for SGT members)

STONES AND CORDS IN GLASSES BY C CLARK-MONKS AND J M PARKER

Identification of defects in glass is of great practical interest and a matter of importance in the economics of glass production. This monograph is intended as a basic text on the subject and will be of use to student and factory chemist alike providing fundamental information on the fault and its source.

1980, A5 (210 mm x 148 mm), 208 pages, black and white illustrations,

£30.00 (£25.00 for SGT members)

GLASS FURNACES: DESIGN CONSTRUCTION AND OPERATION BY W TRIER

(Translated by K L Loewenstein)

The technology and the underlying science of all furnace types are covered in this extensive study. Its objective is to not only deal with the glass furnace in its basic construction and mode of operation, but to include the relevant technical background knowledge.

1987 (reprinted 2000), 294 pages, black and white illustrations, ISBN 0-900682-20-5; £75.00 (£65.00 for SGT members)

RAW MATERIALS FOR GLASS MELTING BY BO SIMMINGSKÖLD

(Revised, edited and translated by K H Teisen & R D Wright)

This handbook serves as a practical guide to raw materials used in glass melting for those concerned with batch handling, glass melting, glass compositions, purchase of raw materials, etc.

1997, A5 (210 mm x 148 mm), 74 pages, ISBN 0-900682-24-8; £22.50 (£12.50 for SGT members)

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