JOURNAL

OF THE

BRITISH SOCIETY OF SCIENTIFIC GLASSBLOWERS

Vol. 7 JUNE 1969 No. 2

Jobling announce an improved range of tubing

Here it is!

Hot from the press... a new Jobling publication detailing their improved range of borosilicate glass tubing for laboratory use. A handsome production in colour. FREE WHEN YOU POST THE COUPON BELOW.

This new book has been produced for the practical man. It is designed for long usage and hard wear. Stiff backed and printed on a plastic coated paper, each page is virtually indestructable with normal usage. Filled with useful data describing the properties of the glass, this important publication also gives the latest details of the Jobling tubing range including sizes and improved tolerances.

Post to James A. Jobling & Co. Ltd., Laboratory Apparatus Division, Sunderland. Please send free copy of the new Jobling Borosilicate Tubing & Rod catalogue, 1969.

Name.....

Position held .....

Address.....

.....

.....

J45

Discoveries are made in

PYREX® (JOBLINGLASS)

James A. Jobling & Co. Ltd., Laboratory Apparatus Division, Sunderland. Telephone: 57251

British Society of Scientific Glassblowers

Founded 1960

Chairman
E. G. EVANS
65 Frambury Lane
Newport, Essex

Secretary
J. W. STOCKTON
34 Kildonan Rd., Grappenhall,
Warrington, Lancs.
Tel. 63162 Home
31211 Ext. 28 Business

Treasurer
L. BENGE
75 Birchen Grove,
London, N.W.9

JOURNAL BOARD

SECTION OFFICERS

Southern Section		**Midland**	
Chairman:	T. Parsell	*Chairman:*	L. C. Haynes
Secretary:	E. White	*Secretary:*	S. G. Yorke
Treasurer:	W. Brench	*Treasurer:*	J. A. R. Hill
Council Representative:	E. White	*Councillor:*	S. G. Yorke
North Eastern		**Thames Valley**	
Chairman:	H. Butler	*Chairman:*	J. S. Macdonald
Secretary:	B. Davies	*Secretary:*	A. Stuart
Treasurer:	G. Robertshawe	*Treasurer:*	F. H. Morse
Council Representative:	S. Moer	*Councillor:*	R. Mason
East Anglian		**North Western**	
Chairman:	E. G. Evans	*Chairman:*	L. Elson
Secretary:	L. Morrison	*Secretary:*	J. Stockton
Treasurer:	A. Stripe	*Treasurer:*	C. Blackburn
Councillor:	R. B. Radley		
Western		**Scottish**	
Chairman:	F. G. Porter	*Chairman:*	W. McMillan
Secretary:	M. Fowler	*Secretary:*	T. P. Young
Treasurer:	D. A. Jones	*Treasurer:*	G. A. S. Finnie

CONTENTS Vol. 7 No. 2 June 1969

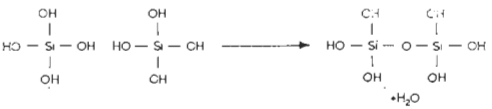
ADVERTISERS

The Journal is published quarterly by the B.S.S.G. and is available free to members and at 10s 0d per copy (or 35s 0d per annum) to non-members. A limited number of back copies are available. Editorial communications should be addressed to the Editor, c/o H. H. Wills Physics Laboratory, Royal Fort, Clifton, Bristol 8, and enquiries for advertising space to C. H. Glover 'Saraphil', Highfield Lane, Cox Green, Maidenhead, Berks. Printed in Gt. Britain by Sawtells of Sherborne Limited, Dorset.

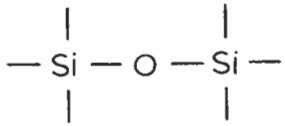
INFRA-RED STUDIES OF SILICA

by Dr. J. Hayes, Unilever Chemical Development Centre
Lecture given at the Society Symposium 1968

Various forms of amorphous silica are known and they can all be considered as poly-condensation products of orthosilicic acid, $Si(OH)_4$. One of these forms is silica gel, which finds extensive application as an adsorbent (e.g. in cameras, instruments) and is manufactured by mixing solutions of sodium silicate and sulphuric acid and allowing the resultant mixture to set in the form of a 'gel'. The process occurring within the bulk of the solution is usually regarded as one of condensation polymerization and is ideally depicted in the following manner:—



Each and every silicon atom must have all four of its valency arms satisfied. Silicon atoms within the bulk of the liquid are thus surrounded in every direction by oxygen atoms to yield an ultimate structure of



chains in three dimensions. Silicon atoms at the surface of the liquid must satisfy the four-valency requirement by retaining or acquiring hydroxyl groups. The surface hydroxyl groups are extremely important, both from the point of view of the catalytic and adsorption applications of the silica product. Without hydroxyl groups (and this situation is encountered when dealing with a silica which has been heated to very high temperatures) there are no catalytic or adsorptive properties.

In recent years, the technique of infra-red spectroscopy has become the most important technique for the study of the silica surface. With the aid of infra-red spectroscopy, we can identify the various types of hydroxyl species and witness their behaviour during chemical reaction. Infra-red radiation refers broadly to that part of the electromagnetic spectrum of longer wavelength than the visible region and shorter wavelength than the microwave region. Radiation energy between about 4,000 cm^{-1} and 660 cm^{-1} (2.5μ and 15μ) is absorbed by the molecule and converted into energy of molecular vibration. The energy absorption pattern thus obtained is commonly referred to as an infra-red spectrum. In its usual form, it is a plot of intensities (either as per cent transmittance or as absorbance) versus wavelength (microns) or frequency (wavenumbers) of absorption. The atoms in a molecule are not connected rigidly but vibrate continuously. The vibrations produced by the various groups of atoms are of a particular frequency and this is determined by the mass of the atoms and the strength of the chemical bond.

The modes of vibration can be demonstrated with the aid of a mechanical model in which the atomic masses are represented as balls, the weight of each ball being proportionate to the atomic weight. The balls are arranged geometrically in accordance with the molecular structure and are joined to each other by resilient springs, the strength of which is approximate to the chemical binding forces. The model is freely suspended. The vibrations which can arise are divisible into two distinct types:—

1. Stretching vibrations – distance between two atoms increases or decreases.
2. Deformation or bending vibrations – temporary change in bond angle while not affecting distance between atoms.

General assignments for stretching frequencies can be derived by the application of Hooke's law.

$$\bar{\nu} = \frac{1}{2\pi c}\left(\frac{f}{\frac{Mx\,My}{Mx+My}}\right)^{1/2}$$

Less energy is needed to produce bending than stretching vibrations of the same bond: bending vibrations are therefore found at lower frequencies. Hydrogen bonding decreases stretching frequencies and increases bending frequencies. When hydrogen is replaced by deuterium, the stretching vibrations occur at lower frequency because of the effect of the heavier mass of the deuterium.

Because of the diffuse nature of the molecules of a gas the examination of a gaseous sample is relatively easy and the resultant spectra extremely characteristic: The examination of liquid spectra also presents few problems but a number of difficulties arise when dealing with solid samples. Passage of the infra-red beam is often difficult because of the vast number of particles in any solid sample and the closeness of their packing. To overcome these practical difficulties, two techniques have been developed. In the foremost of these the solid sample is ground into the form of a paste with an inert hydrocarbon media and the mull then smeared on to the infra-red plates. In practice, normally two mulls are made up, one in a hydrocarbon media (Nujol) and one in hexachlorobutadiene to give a complete picture of the spectrum. However, these devices would be of little use in the examination of silica. A second procedure involves dilution of the sample with potassium bromide (which is transparent to IR

radiation) and examination after compression of the resultant mixture into the form of a thin disc or wafer. Unfortunately, this method also will not suffice since the potassium bromide diluent may react with reagents we wish to use during the course of our experiments. Recently it has been found that some forms of pure silica can be compressed into the form of transparent discs suitable for infra-red examination without the aid of any diluent.

When we look at the silica disc in the infra-red beam the resultant spectrum depends to a large extent upon what pre-treatment the silica has experienced. Normally the pattern which arises is as follows:

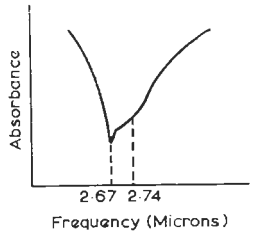
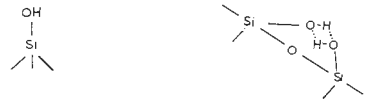


Diagram 1

The band occurring at 2.6μ (3,650 m^{-1}) is thought to be due to free hydroxyl groups situated alone and isolated free from the sphere of attraction of neighbouring groups. The absorption band located at 2.74μ (3,650 cm^{-1}) is attributed to interacting hydroxyl groups, i.e. those groups which because of the proximity of neighbouring groups are hydrogen-bonded to their nearest neighbours[1].



i. free OH group ii. interacting or hydrogen-bonded OH group

Any molecular water present in the sample is shown by a much broader band at approximately 2.9μ; in practice we find that molecular water is removed by heating the sample in vacuum at 180°C.

Heat treatment of the silica sample at or above this temperature of 180°C in vacuum leads to a decrease in the number of interacting groups present by a process of condensation:—

This process of condensation is more clearly observed by setting the recorder pen on the absorption peak located at 2.74μ and witnessing the band sharpening which occurs on heating the sample.

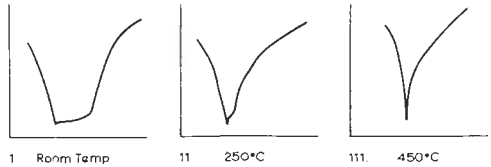
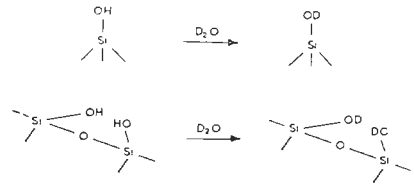


Diagram 2

The free or isolated hydroxyl groups are very much less affected by heat treatment because of their distance apart.

The absorption bands due to the various OH groups may be further sharpened and more clearly seen by replacing the hydrogen with deuterium:—



In this case the absorption band is displaced to lower frequency due to the heavier mass of the deuterium (although identical chemically). The absorption of the deuterium analogue of the free hydroxyl group occurs at 3.6μ and that of the deuterium interacting group at 3.7μ[2].

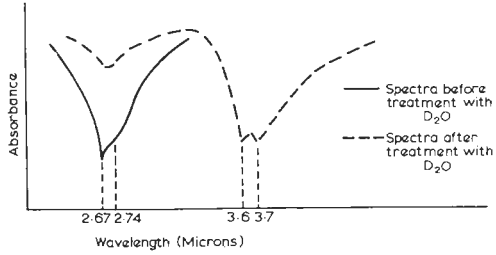


Diagram 3

This then is the basis of the technique – the identification of the various hydroxyl species as their hydrogen and deuterium analogues.

The reaction of the silica surface with various co-valent halides has been studie dusing similar techniques. Reaction with boron trichloride is found to proceed readily at room temperature to yield a surface in which most of the hydroxyl groups have been eliminated. A residual band at 2.74μ is thought to be due to hydroxyl groups hidden so deep within the silica lattice as to be unavailable for reaction with the gaseous boron

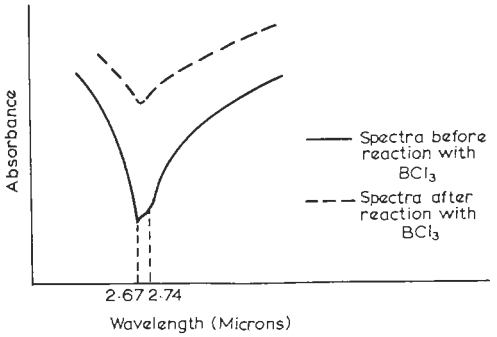
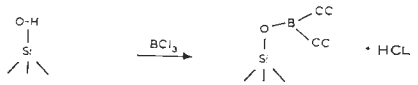
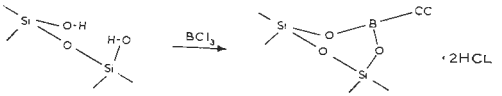


Diagram 4

trichloride. Of course the complexes formed as a result of the reaction will again depend on the stereochemistry of the hydroxyl group concerned:



i. free OH groups – each hydroxyl group = 2 chloride groups



ii. 2 interacting OH groups = 1 chloride group.

The beauty and simplicity of the above reaction can be utilised in the estimation of the number of free and interacting hydroxyl groups present on a silica sample[3]. The silica surface can also be reacted in a similar manner with silicon tetrachloride and titanium tetrachloride, although reaction in these two cases requires a much higher activation temperature[4]. By use of these reactions, it is possible to modify the surface in order to impart desirable properties for a variety of industrial applications.

Obviously the infra-red cell used during the course of this work is of the utmost importance. The model we have employed with the most success has been constructed according to a design perfected by Dr. J. Hockey *et al*, of the University of Manchester, Institute of Science and Technology[5]. The prime requisites of the cell are that it will hold the silica sample (in the form of a disc) in the infra-red beam under vacuum conditions and that it will be constructed of

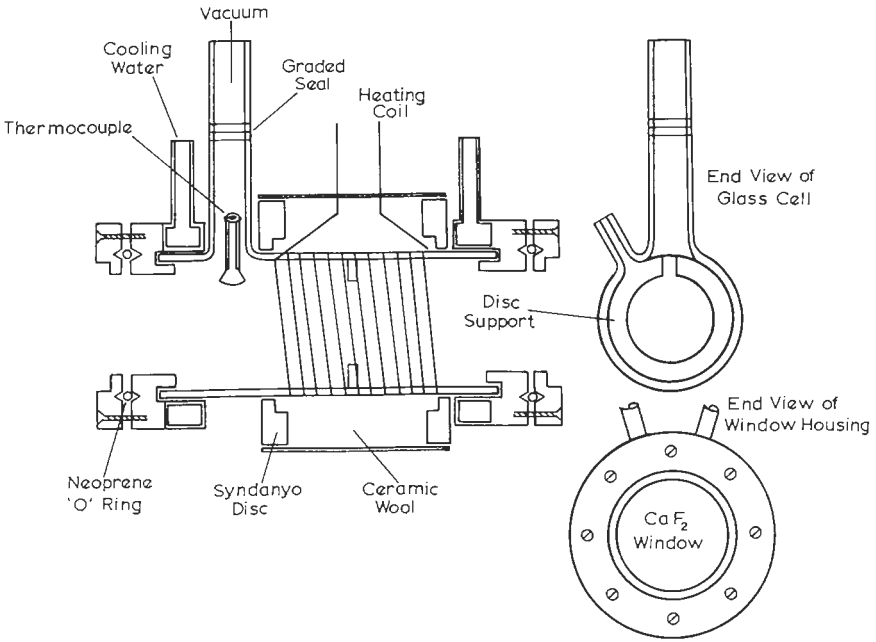


Fig. 1 Construction of cell

materials capable of withstanding temperatures between ambient temperature and 750°C. This temperature range requires that the body of the cell be made from quartz silica and also that the ends of the cell be water-cooled in order to give protection to the transparent calcium fluoride windows through which passes the beam of infra-red radiation. Since many of the reagents we employ during our experiments are corrosive, the cell must not contain material which might be affected. In this context, it ought to be pointed out that the cheapest infra-red plates are made from sodium chloride crystals, but we are compelled to use calcium fluoride for our windows since sodium chloride would be adversely affected by the H_2O and D_2O used during our experiments. The construction of the cell is shown schematically in Fig. 1.

Both the length of the cell and consequently the length of the furnace section are determined by the size of the sample aperture of the infra-red spectrometer to be used. Thus a longer version permits greater length for the furnace section and is found to be more resilient because of the greater cooling efficiency that can be incorporated.

The first stage in the construction of the cell is to cut the required length from quartz tubing and then subsequently to affix the quartz disc which is designed to hold the silica sample erect. This quartz disc had previously been cut with a slot in its circumference to enable both sides of the disc to be evacuated from the one point. The main vacuum arm and the exit for the thermocouple lead are then blown on to the body of the cell which is subsequently positioned in the glass lathe ready for furnace winding (about 200Ω resistance). The nichrome heating wire is carefully wound on to the body, each strand being insulated from each other and held to the quartz body by means of antostic asbestos cement. The spectroscopist is protected from this furnace by means of an outer pyrex shell of approximately 2¼" diameter which is held in position by specially-cut syndanyo discs. The space between the quartz body of the cell and the outer pyrex shell is filled with Triton ceramic fibre before the last syndanyo ring is fixed into position. The next stage is to cement the metal cooling pieces on to the ends of the cell and also the calcium fluoride windows into the metal window housings. Araldite adhesive has been found most suitable for this purpose. When starting an actual experiment, the normal procedure is to place the silica disc in position, hold it vertical by means of firm platinum wire, and then to screw the window housings into position before attaching to the vacuum line. An infra-red cell constructed according to this design has been found to give excellent service even after consistent experiments conducted at 750°C.

References

1. **Hambleton, Hockey and Taylor,** Trans.Farady Soc. 1966, **62**, 795.
2. **Hambleton, Hockey and Taylor,** Trans.Faraday Soc. 1966, **62**, 801.
3. **Boehm, Schneider and Arendt.** Z.Anorg.Allg. Chem, 1963, **320**, 43.
4. **Hayes and Mitchell** to be published.
5. **Armistead, Hambleton, Hockey and Stockton** J.Sci.Inst. 1967, **44**, 872.

LABORATORY DISTILLATION

by Dr. J. L. Hales, National Physical Laboratory, Teddington

Lecture given at 1968 *Symposium*

The objectives of laboratory distillation are the purification or refinement of crude chemical compounds, and the separation or fractionation of individual compounds from mixtures. Examples of these processes are seen in the separation of purified compounds from petroleum oil and from coal tar. The use of distillation as an aid to analysis has been superseded by alternative methods such as infra-red spectroscopy and gas-liquid chromatography.

To appreciate the significance of fractional distillation, it is necessary to consider the subject of vapour pressure. A liquid in a closed air-free container will produce vapour, which will attain a certain equilibrium pressure corresponding to the temperature of the liquid. If this temperature is raised, the equilibrium vapour pressure will also rise. The relationship of vapour pressure to temperature for a pure compound, say for benzene, is unchanging and is unique for the compound concerned. Measurements on these relationships form an essential part of the programme of the Chemical Standards Division of the National Physical Laboratory.

The boiling-point of a liquid is the temperature at which the vapour pressure becomes equal to the external pressure. Thus water at normal atmosphere pressure boils at a temperature of 100°C, and this temperature will decrease as the pressure is reduced.

In the simplest form of distillation, liquid is boiled and the vapour condensed and collected. This operation leaves behind non-volatile soluble materials such as salt, grease or tarry impurities. Advantage is taken of this process, for example, in the distillation of sea-water, in countries where fresh water is in short supply.

Where we are concerned with the distillation of a mixture of components, say of benzene and toluene, the situation is less simple. If such a mixture is held in a closed air-free container, in equilibrium with its vapour, the total vapour pressure is equal to the sum of the partial vapour pressures of the individual components (Dalton's

law). Each component contributes vapour at a pressure corresponding to the temperature of the liquid, and this pressure is multiplied by the mole fraction of that component present (Raoult's law). Provided the vapour pressures of the pure components are not the same, the composition of the vapour will differ from that of the liquid. Thus since benzene is more volatile than toluene, the vapour will be richer in benzene than the liquid. If this equilibrium vapour could be removed to a separate container, condensed, and allowed to come into equilibrium with its vapour, this vapour would show a *further* enrichment in benzene. This example is a picture of what occurs in fractional distillation, each vapour-liquid equilibrium stage being called a "theoretical plate", a terminology arising from the use of "plates" in bubble-cap distillation columns. It should be appreciated that these real plates have an efficiency of *less* than one theoretical plate, the relationship is only in name. Liquid-vapour equilibrium is studied by a "one-plate" apparatus, an Equilibrium Still, such as the Gillespie still which we have found to give reproducible results. However all such stills involve the boiling of liquids, and since boiling cannot take place unless the liquid is slightly superheated, the equivalence of such stills to one theoretical plate is suspect. We prefer to use a sounder "static" method in which the mixture is shaken up in its closed container at a closely-controlled temperature, after which minute samples of liquid and of vapour are removed and analysed by gas-liquid chromatography. The results can be applied to deducing the efficiency of a distillation column in terms of theoretical plates, by examining the compositions of the mixture both in the boiler and at the top of the column.

All distillation column assemblies, whether batch or continuous feed, follow a similar pattern. Heat is fed into a boiler at the base, and the vapour passes up a packed column where it comes into intimate contact with descending liquid, which is the condensed vapour from a reflux condenser at the top of the column. Since such columns may have efficiencies exceeding 50 theoretical plates, the vapour at the column head will show considerable enrichment of the most volatile component, so much so that effective separation of compounds boiling only one degree apart can be achieved. The packing may consist of gauze elements (in stainless steel for corrosion resistance) such as Stedman or Helipack, which occupy the full width of the column. Small individual elements such as wire or glass helices can simply be poured into an empty tube. Glass bubble-cap columns are also effective, but since they form integral units they are not easy to repair if damaged.

The column is usually (but not necessarily) operated above room temperature and is jacketed either by the use of a heater winding with electrical output control, or of a silvered vacuum jacket which avoids electrical control. Some form of vapour or liquid take-off device is used at the column head to withdraw material at a set rate. Thus a "reflux ratio" of 20 implies that 1 ml of distillate is removed for every 20 ml of liquid reflux returning down the column. A thermometer at the head indicates the boiling-point.

When we wish to separate components whose boiling-points are practically coincident, resort may be made to the use of azeotropes. Azeotropes are constant-boiling mixtures which on distillation behave similarly to pure components. The addition of a third component, an "azeotrope former", may result in the production of one or more azeotropes, the boiling-points of which are sufficiently different to permit fractionation of the original components. Thus the emoval of water from ethyl alcohol, B.P. 78.3°C, is hindered by the occurrence of an alcohol-water azeotrope, B.P. 78.15°C. However the addition of benzene results in formation of a water-benzene azeotrope, B.P. 69°C, and of an alcohol-water-benzene azeotrope, B.P. 65°C, so that water can then be removed readily.

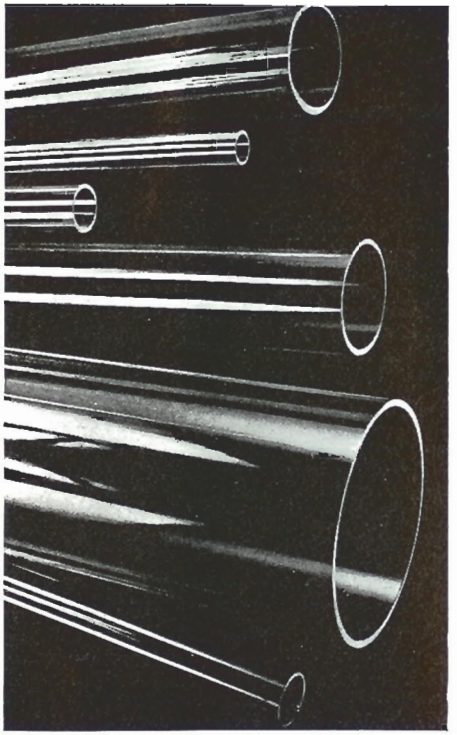
Where we are concerned with materials which boil at inconveniently high temperatures, with resulting decomposition of the substance concerned, it is normal to distil at reduced pressure. This involves the use of a "barostat", a pressure control device. At pressures of the order of 20 torr the pressure drop along the column packing becomes significant, and it is necessary to use a "spinning band" down the centre of an empty column. Although this arrangement is less efficient than a packed column, it involves a very low pressure drop, so that pressures as low as 0.1 torr can be tolerated. For substances of high molecular weight it may be necessary to go below this pressure into a region where the nature of the boiling phenomenon changes, and it is then essential to use a "molecular still".

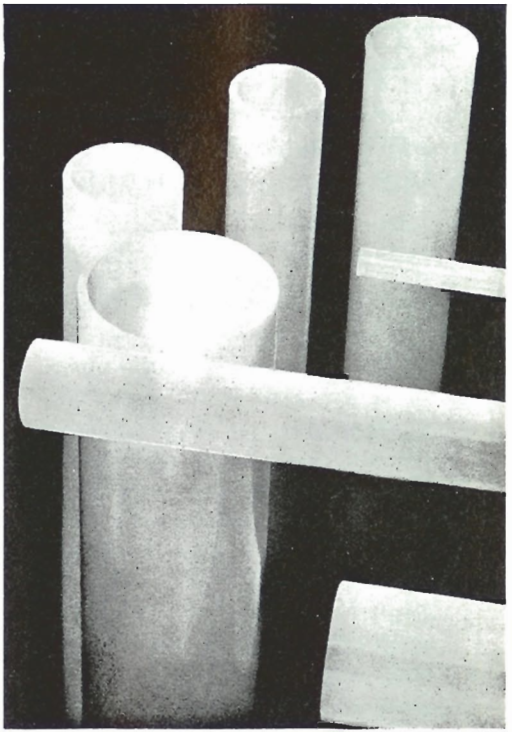
The thermometer at the head of the distillation column can be supplemented by an electrical type of temperature probe, whose output may be displayed on a recorder chart. This supplies a record of temperature against quantity of material distilled. "Plateaus" occur where the boiling-point is sensibly constant during collection of a purified component, andthese boiling-points help to characterise the compound concerned. However, it is more satisfactory to use a supplementary analytical method. Thus infra-red spectroscopy gives a characteristic "fingerprint" of the material(s) present, and gas-liquid chromatography (G.L.C.) can be used to estimate the mixture composition, particularly with regard to the level of impurities in the constant-boiling cuts. G.L.C. is in fact closely related to fractional distillation and a packed G.L.C. column may exceed 1,000 plates efficiency. Also, preparative G.L.C. is now an accomplished fact; and although the yield of material may be as low as 20 g per day, the high purity of the products makes this acceptable.

Tubing and Apparatus

for Pure Chemistry at High Temperatures

Pure fused silica is an inert high temperature material which has a high thermal shock resistance and transmits Ultra Violet, Visual and Infra-Red radiation.





SPECTROSIL®

synthetic fused silica

Transparent tubing for special applications where extreme purity or transmission in the far ultra violet region is required. Recommended for semi-conductor work.

VITREOSIL®

pure fused silica

Supplied in transparent or translucent form in a wide range of diameters and lengths. Excellent electrical insulation properties.

T·S·L

THERMAL SYNDICATE LIMITED

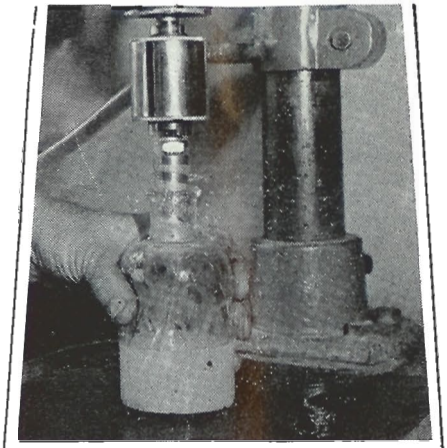
P.O. Box No. 6, WALLSEND, NORTHUMBERLAND
Tel: Wallsend 625311. Telex: 53614
9 BERKELEY STREET, LONDON, W.1. Tel: 493-1711. Telex: 263945

SILICA INDUSTRIAL WARE • LABORATORY WARE • OPTICAL COMPONENTS • HIGH TEMPERATURE OXIDE CERAMICS

DIAGRIT
TAPER GRINDING TOOLS
FOR LABORATORY GLASSWARE & CERAMICS

The simplest, cleanest and most effective way of producing accurate male and female tapers in glass and ceramics at one tenth of the previous operation time. The secret lies in the steel core coated with diamonds in a spiral pattern, giving a reamer life of between 3,000 and 6,000 bores according to the accuracy of the preformed joint.

Diagrit range of diamond taper tools covers all standard sizes and includes tools designed by us to suit special applications. Send for our catalogue showing the comprehensive range of diamond tools. Our Technical Department is available to advise you



Taper reaming a 500 cc bottle to size B24. A badly chocked bottle will be completed in 5-10 seconds

Taper reaming a borosilicate glass desiccator lid, size B34, at the works of Jencons (Scientific) Ltd., Hemel Hempstead. This operation is completed in only a few seconds. Tools can be supplied to both drill and ream out the hole in one operation

DIAGRIT ELECTROMETALLICS LTD.
STAPLEHURST, KENT.
Phone STAPLEHURST **662**

ABSTRACTS

Compiled by S. D. Fussey

GLASS

(581) **Increasing the Strength of Glass by Etching and Ion Exchange.**
N. H. Ray & M. H. Stacey, *Jour. Mat. Sci.*, 4, 1, 73–79, Jan. 1969.
Etching with hydrofluoric acid can increase the tensile strength of soda-lime glass to about 3×10^5 p.s.i. Subsequent heating and abrasion seriously reduces this strength. Water absorbed on the surface is the major factor responsible for the heat damage on etched specimens and its elimination enables ion exchange to produce compressive stress on the surface thus protecting the glass from handling damage. Ion exchange in molten potassium and silver nitrates has enabled strengths of about 10^5 p.s.i. to be obtained even with deliberate surface abrasion. S.D.F.

(582) **The Biology of Glass.**
P B. Adams, *New Sci.* 41, 630, 25, 2nd Jan. 1969.
The reaction of acids and alkalis with glass is reviewed. New research is now being done where glass is in contact with fungi, living and marine organisms, some of which have a corrosive effect. Vaccines can also be affected when stored in glass ampoules. Graphs and photographs. D.A.H.

GLASS APPARATUS

(583) **Construction of Spectro-photometer Cells with Spacings Less than 10μ**
Learco Minghetti & Sam Naiditch, *Rev. Sci. Instr.*, 40, 1, 188–189, Jan. 1969.
Quartz, borosilicate and other special glasses are used to construct these thin spectro-photometer cells. Clean windows are clamped together with distilled water between them as a spacing medium giving 2 – 6μ spacings. Larger, reproducible spacings are achieved by using solid spacers. Sketches. S.D.F.

(584) **Low Temperature Recrystalization Tube.**
B. Giese, *Jour. Chem. Educ.*, 45, 9, 610, Sept. 1968.
A simple jacketed tube with sintered disc. F.G.P.

(585) **Ultra H.V. Contact Angles.**
M. E. Schrader, *Jour. Coll. & Inter. Sci.*, 27, 4, 744, Aug. 1968.
Details of sample chamber for measurement of contact angles. F.G.P.

(586) **Rotatable Multiple Sample Mount for Bakeable Vacuum Systems.**
W. J. Baxter and R. J. Dusman, *Rev. Sci. Instr.*, 40, 1, 163, Jan. 1969.
Full description and drawings of a glass and metal assembly enabling separate electrical connections to be maintained to each of a number of samples which may be rotated to any orientation within a bakeable high vacuum system. Electrical connections are made through helical tungsten springs, which, during rotation of a central convoluted tube, extend and wrap around the valleys of the tube without touching each other. These springs allow the sample support tube to be rotated plus or minus 200 degrees. S.D.F.

(587) **Surfactants on the Coalescence of a Drop.**
T. D. Hodgeson & J. C. Lee, *Jour. Coll. Inter. Sci.*, 30, 1, 96, May 1969.
Full details of a coalescence cell showing method of drop formation. F.G.P.

(588) **Kinetics of Condensation Polymerization.**
E. L. Mc Caffery, *Jour. Chem. Educ.*, 46, 1, 69, Jan. 1969.
An easily made apparatus for polyester formation consisting of a four-necked flask and standard components. Method of use fully described. F.G.P.

(589) **Simple Heavier than Water Extractor.**
Carl H. Snyder, *Jour. Chem. Educ.*, 46, 1, 27, Jan. 1969.
Modified Friedrich extractor. A wire helix in the body is used to divide and disperse drops of solvent as they pass through the solution being extracted. With chloroform as solvent, 25ml. can be extracted from a body of 15cm. × 13cm. F.G.P.

(590) **Mercury and Glass Adhesion in Aqueous Solutions.**
Usui & Yamasaki, *Jour. Coll. Inter Sci.*, 29, 4, 630, April 1969.
Schematic design of apparatus for measurement of adhesion of mercury and glass. F.G.P.

MISCELLANEOUS TECHNIQUES

(591) **No Adhesives in Glass-metal Seals.**
Iron Age, 47, 29th Aug. 1968.
Scant details of a claimed new process for hermetically sealing glass to metal without the use of adhesives. Sealing is accomplished electrically using 150 to 1,000 volts D.C. S.D.F.

(592) **Encapsulation of Aerosol Particles.**
G. Langer & G. Yamate, *Jour. Coll. Inter. Sci.*, 29, 3, 452, Mar. 1969.
Details of jacketed flasks and method of use. F.G.P.

(593) **Electrophoresis in Liquids.**
H. G. Parreira, *Jour. Coll. Inter. Sci.*, 29, 3, 434, Mar. 1969.
Design and use of a flat cell for micro-electrophoresis in liquids having very low dielectric coefficients. F.G.P.

(594) **A Convenient Glass to Glass Connector.**
K. E. Collins, *Jour. Chem. Educ.*, 46, 3, 179, Mar. 1969.
An "O" ring is used to make a seal between the lipped end of one tube and the olive of another. Sublimation tubes and vacuum traps can be made without traditional joints. F.G.P.

(595) **A Convenient Method of Sealing Wires into Glass Tubing.**
A. K. Vijh & R. S. Alwitt, *Jour. Chem. Educ.*, 46, 2, 121, Feb. 1969.
A special type of teflon sleeve is slipped over wire and glass tube and heated with a hot air gun to give a leakproof, inert seal. F.G.P.

(596) **Simple Method for Preparing Spherical Electrodes.**
F. Sharpe & G. Meibuhr, *Jour. Chem. Educ.*, 46, 2, 103, Feb. 1969.
A glass capillary tube is used to form the round pellet by drop forming in the molten state. F.G.P.

(597) **Safety Shut-off for Water-cooled Devices.**
Bailey, El-Guindy, Tangredi & Walden, *Jour. Chem. Educ.*, 46, 1, 31, Jan. 1969.
The extended arm of a micro switch has a cup attached. Holes in this cup permit a time lag in which actual switch off takes place. F.G.P.

(598) **The Control of Time.**
A. Scott, Engineering, 207, 5377, 749–751, May 16th 1969.
A review of timers in general use. S.D.F.

(599) **Developments in the Manufacture of Mirrors.**
Dr. Bruno Schweig, Glass, 46, 5, 142–143, May 1969.
A brief survey covering 4000 years of mirror making. S.D.F.

VACUUM

(600) **The Use of a Shrinkable Sleeve in a Lubricant-free Connector for Glass Vacuum Systems.**
B.S. Del Duca, *Jour. Sci. Instr.*, series 2, 2, 211, Feb. 1969.
Two ball joint cup type tubes are butted together with an "O" ring between. A short length of polyolefin tubing covers the join and is then heated with a 750°F. heat gun to shrink the sleeve uniformly. Pressures of 10^{-6} torr are claimed. May be used up to 250°C. and with air cooling 330°C. D.A.H.

NOTES

The Brussels base Corning Glass International, a subsidiary of Corning Glass of U.S.A., has opened an office at 3 Cork Street, London.

A new edition of B.S.1739 – Filter Flasks (Metric Units) – has just been published, replacing the original standard of 1951 and the revised version of 1957.

ABSTRACTORS

Mr. Fussey reports that there are now only three members searching the literature for abstracts and the service would be improved if some more volunteers would undertake to scan one journal each as they appear.

Offers to help will be appreciated and should be addressed to 59 Whitedown Road, Tadley, Hants.

ABSTRACT

The risk of intoxication by Nitrous Vapours with the use of Natural Gas—Air/Oxygen Burners

by A. B. von Haaften

SHELL MEDICAL BULLETIN No. 5 FEB. 1967

The author quotes a paper in the *Ned Chemisch Weekblad* of Feb. 1966 in which it is stated that the substitution of natural gas for town gas in laboratories results in higher concentrations of NO_2 because of increased flame temperatures and possibly a higher nitrogen content in the fuel gas. He gives the results of an investigation in Amsterdam Laboratories which shows that although the NO_2 concentration is often above the maximum allowable of 5 ppm there were no particular ill effects and high values are just as likely to be achieved using town gas. With the burners operating on natural gas at normal capacity for thirty minutes without ventilation the concentration reached was 22 to 75 ppm and with the usual ventilation 18 to 47 ppm. Window fans were then installed and ventilation apertures provided just above floor level which resulted in a reduction to below the 5 ppm M.A.C.

TOXICOLOGY

NO_2 above 5 ppm can be smelled. At 10-20 ppm there can be slight irritation of the eyes, nose and upper bronchial tubes. Real intoxication occurs at concentrations above 50 ppm and it is estimated that working for a whole day in more than 100 ppm could cause death within 24 hours resulting from asphyxia due to pulmonary œdema. Intoxication with NO_2 is treacherous in that symptoms may appear some time after the lethal exposure so are not immediately recognized.

There are other types of intoxication and symptoms likely to appear after prolonged exposure as a result of formation of nitric acid in the lungs.

Measurements of NO_2 concentrations were made in glass shops using propane (containing no nitrogen), town gas, and natural gas and in each case high concentrations of NO_2 were observed.

Comparative figures are given for town gas and natural gas in Amsterdam.

Composition %

	Town gas	*Natural gas*
CO	11.2	nil
CH_4	22.2	81.6
H_2	44.4	nil
N_2	9.7	14.3
CO_2	9.2	0.9

Flame Temperatures

	Combustion with air	*Combustion with oxygen*
Natural gas	1800–1900°C	~2700°C
Town gas	1900–2000°C	~2800°C
Propane	~ 2000°C	~2800°C
Acetylene		~3100°C

In the past there may have been symptoms of NO_2poisoning attributed to other causes but now much larger glass apparatus is manufactured in Pyrex which calls for higher working temperatures and hence the production of greater quantities of NO_2 irrespective of which fuel gas is used.

Ventilation which prevents the NO_2 level exceeding 5 ppm should be used and it is recommended to carry out a regular check. J.H.B.

SILICA

Talk given to the Southern Section by W. YOUNG Dec. 1968.

Firstly, Mr. Young told us that there are three types of Silica, these are Transluscent, Transparent and Synthetic.

Transluscent is made from silica sand fused around a carbon core; the resulting surface is very rough: it can be drawn into tubes or moulded. Small items can be moulded 400–500 at one time. Tubes can be obtained with either a rough or glazed surface.

Transparent Silica is manufactured from quartz crystal. This is first acid treated for 24 hours then it is quenched in a gas fired furnace; from there it is placed in a tank of continuously flowing water. By this time the quartz has changed in appearance to something like a large snowflake. In this condition the crystal can now be crushed. The crushing is achieved by using heavy quartz rollers; the result is a powder. There is considerable wear on the rollers and these have to be machined every day or so, therefore the rollers have a limited life, thus accounting for a fair proportion of the cost of transparent quartz items. The powder is fused in much the same way as the silica sand.

Until a few years ago 50 millimetres bore was the largest tube obtained. Now, however, sizes up to 8 inches bore are drawn. Larger sizes than this are worked to diameter in the lathe.

Synthetic quartz is made from Silicon tetrachloride. It is gathered from the flame of a special burner. A silica tube is used to gather the synthetic quartz and a round end formed on it, this is blown out and more synthetic quartz is gathered on the new round end until a rather uneven tube is formed. This is then worked until it is of even wall and diameter.

Tubing of various sections other than round is formed by drawing round tubing over a mandrel of the appropriate shape. Devitrification, providing the tubing is clean and free from finger marks, can be removed by flaming off.

The jointing of large size tubing is achieved by first feathering the ends. The resulting 'V' shaped gap is filled with rod. A twisting motion should be used in order to keep bubbles out of the joint and the end of the rod used for filling should be kept fine or pointed.

Mr. Young passed amongst the members for inspection samples of various tubes, window seals and the end of a silica tube, upon which synthetic quartz had been gathered. Question time was not confined to the end of the meeting, people asked their questions as they came to mind.

One question was on the cleaning of silica and quartz. Mr. Young replied that he used hydrofluoric acid although there was a recommended mixture by Thermal Syndicate.

Two people strongly urged Mr. Young to impress upon the members the danger both from the liquid and the vapor. In fact Mr. Morrison, when proposing a vote of thanks for Mr. Young's very fine talk, quoted an instance in which a man used a solution containing H.F. to remove the scratches from a car windscreen with his bare hands, washing them immediately after; he had both hands removed at the wrist as this was the only remedy. The other point brought out by Mr. Morrison was that the inhalation of the vapor deposits concentrated H.F. in the nose and lungs. Therefore, H.F. should never be used except in a fume cabinet and unless full protective clothing is worn. You have been warned. Remember, you have only one life ! !

Mr. Young rounded off his talk with a demonstration at the bench: after an invitation to all members to try their hand Mr. Behrens manfully "had a go".

As mentioned earlier, Mr. Morrison proposed a vote of thanks and Mr. Young was roundly applauded by all present. Many members remarked that it had been a very worthwhile evening.

The number of members who signed the book was 42; quite a number left without doing so and my guess is that all told 50 members attended. Once again my congratulations on a grand turn out and to Mr. Young. T.J.M.

Information

The cleaning fluid referred to by Mr. Young, as recommended by Thermal Syndicate, is in their publication *About Vitreosil* on page 11. It is as follows:

Hydrofluoric acid (sold as 40%) 2 parts by volume
Nitric acid (1.42 S.G.) 7 parts by volume
Water 7 parts by volume.

Thermal Syndicate Ltd. have also published a special leaflet on the cleaning of fused silica prior to working, copies of which are obtainable from: Mr. G. E. Barrett, 9 Berkeley Street, London W.1.

NORTH WESTERN SECTION

Conference on Fuel Gases, 7th May 1969

This meeting took place in the Centenary Theatre of Joseph Crossfield & Sons, Warrington, Lancs. and the firm's catering department supplied refreshments and a buffet. Mr. J. Frost of the University of Reading acted as Chairman. The conference was originally promoted to consider Natural Gas but as some members and their employers are contemplating using other gases it was decided to include propane and though it is realised that there are many other possible fuel gases the small scale of the conference necessitated some restriction of the field covered.

Two lectures were given, the first by Mr. K. Rhodes of the Nordsea Gas Appliance Co. who outlined the differences between various gases, safety precautions and the changeover procedure from town gas to natural gas. Mr. Rhodes has studied glassworkers using natural gas in the U.S.A. and fully appreciates the special requirements of the Scientific glassblower which must be communicated to the Gas Boards.

The second lecture was by Mr. R. Cescotti of W.S.A. Engineering Co. Ltd. who had adapted his now famous talk on the combustion of fuel gases to the gases under consideration. Following these lectures a period of three hours had been allocated to the study and use of various burners on display after which a panel consisting of Mr. Rhodes, Mr. Cescotti, representatives from the N.W. Gas Board, Shell Mex and B.P., and Calor Gas was formed to answer questions from the audience.

The general conclusion was that the changeover from town to natural gas is not going to be easy for the glassblower and it is likely that in some cases other gases will be substituted because of greater flexibility, but as some of these are heavier than air, low level ventilation will then be necessary to avoid the possibility of explosive mixtures resulting from accidental leaks.

Opinions vary as to the best models of burners for glassworking, which at the moment are a matter of personal preference by the user and not related to the purchase price, those on exhibition ranging from £30 to £110. Gas Boards are obviously going to be reluctant to bear the cost of expensive burners and the policy may vary from one Board to another.

In addition to the difficulties of changeover it is clear that the glassworking, techniques now used with town gas will have to be adjusted to fit the new conditions.

J. W. STOCKTON

See also abstract on page 19

COUNCIL MEETING 31st May 1969

The agenda was shorter than usual owing to the absence of reports prior to the meeting but some of the items were of great interest and led to prolonged discussion.

Thermal Syndicate Award

A letter had been sent to Mr. P. Browell of Thermal Syndicate Ltd. accepting his recommendation to consult silica working experts when judging entries for the award and a reply was to hand thanking the Society for its co-operation and naming several experts whose advice could be sought. These have been passed to the Board of Examiners.

Board of Examiners

Information was available from the secretary, Mr. N. H. Collins, that the judging for the T.S.L. Award will take place on the 16th August and those entering should submit their work in good time.

Two more members passed the Certificate of Competence examination on the 16th April :—

E. M. S. Musanje, 24 Waterford Road, Guildford, Surrey.

Raymond Gannon, 54 Haldon Road, West Hill, London S.W.18.

Other elementary and Stage I examinations have also been held at various centres.

Training

Members of Council had been circulated with copies of the guidelines issued by the Ceramics, Glass and Mineral Products Industry Training Board. There was strong disapproval of the training schedule and general contents, and the Society's Board of Examiners are being asked to protest on behalf of Council.

Finance

Mr. L. Benge, the Society Treasurer, was able to report a substantial balance of income over expenditure for 1969 and a deposit account is now yielding an appreciable interest from the reserves.

A large number of members have not yet renewed their subsciption but the loss has been partially offset by several new ones. He also reported that there are many cases of cheques being received which are not properly drawn and members are requested to follow instructions to *make cheques payable to the Society — not an individual*, and also to cross them.

There is a delay in circulating the accounts for 1968 which are still awaiting audit.

Wages Scales

A lively discussion on this subject took place and the view put forward by the few sections who had considered the matter was that the objects of the Society should remain unaltered and we should not attempt to evaluate a wage scale for glassblowers who have widely different functions and standards, but whenever consulted on salaries by

outside organisations should attempt to see that they are realistic.

1969 Symposium

Arrangements are progressing satisfactorily and hotel bookings being received. No more single rooms are available but the double ones have single beds and it would be helpful if members booked in pairs as soon as possible. The trade stands are also being filled.

Membership Certificates

Mr. Stockton reported that the fixing of an embossed wax seal to these certificates had proved a very tricky and unsatisfactory operation, and safe distribution even more difficult. Mr. Thompson and Mr. Howcroft of the University of Lancaster had offered to do the sealing but in view of the remaining difficulties of distribution and deep frames needed to accommodate the wax seal it was decided to abandon the process with thanks to Mr. Thompson and Mr. Howcroft for their offer.

Rule Books

Mr. J. W. Price has assembled a new edition of the Society rules and one Xerox copy is in the possession of each section. Printing will follow and each member will receive a copy.

Insurance

An investigation had been carried out by Mr. L. Benge on the premium needed to cover Society members against accidental death, loss of eyes or limbs. He will try to obtain a lower rate but in the meantime will those interested please forward their names. See page 25.

With regard to cover while attending meetings on behalf of the Society, the previous ruling that the Society cannot undertake special insurance still stands.

SECTION ACTIVITIES

Southern Section

February Meeting

I set forth for Queen Elizabeth College in blizzard conditions with a feeling that I was a 'nut' and would be the only person there. Imagine my surprise on arrival to find Mr. Jones and his sons already there and well ahead in preparing a display of signs and samples of glass tubing and letter forms, together with projector and screen: Mr. W. Young was also giving a hand.

As the time approached members began to appear in ones and twos; by 7.30 p.m. when Mr. Jones started his lecture, 13 members were present: not least of these heroes was Mr. Conway, having struggled up the hill in blinding snow. The last member to arrive was Mr. 'Freddy' Crisp, having come by bus and taken $1\frac{1}{2}$ hours to make the journey. How's that for enthusiasm?

Mr. Jones rewarded the efforts of these members with an exceptionally interesting lecture, continuously illustrated by slides and various parts that go to making a modern illuminated sign. Each sign has to be sold twice before it is made; first to the customer – according to Mr. Jones a not too difficult job – then to the planning officer, a much more difficult operation.

Draughtsmen produce the drawings of the sign, with reverse copies for the benders. The hand torch is much used by the bender, as is also the cannon burner. Most benders use the full 5ft. lengths of S.95 Soda tubing; some find it easier to shorten the lengths. When long, slow bends are required asbestos covered nichrome is coiled closely around the tube which is heated by this means. The ribbon burner is also used for bending.

When the bending is complete the tubes are cleaned by washing with detergent and water. Plugs of cotton wool are blown through the tubes to dry them. The inside of many modern sign tubes is coated with fluorescent powder. To obtain this coating Phosphoric acid is poured into the tube and then the tube is dried. The fluorescent powder is then poured into and tapped through the tube.

The electrodes are of the metal cylinder type and are mounted on a lead glass pinch by spot welding to the sealed wires. After degreasing they are sealed in either by machine or by hand.

The completed tubes are pumped and gas filled, Neon and Argon and Helium being used. Helium is used for cleaning. R.F. heating is used to degas the electrodes. During the pumping process mercury is introduced into the tube. The tubes are then aged.

Transformers are required to run the tubes, sizes range from 1,000 volts to 10,000 volts. Most sign manufacturers buy these from manufacturers of electrical gear. 100% volts are required to start the tubes and 50% to run them.

In addition to the glass bending shop the sign industry has sheet metal shops and workers of Acrylic sheet, which is used in many colours. This material is easily worked by cutting, and bending with localised heat.

The whole sign is assembled in the factory in order to rectify any faults before it is sent out for erection on its permanent site.

During question time Mr. Jones told us that the pictures and designs on acrylic sheet are hand painted. Questioned on the quality of the vacuum obtained in the tubes before gas filling Mr. Jones said the 10^{-3} to 10^{-5} was all that is required.

Mr. Tindell proposed a vote of thanks to Mr. Jones.

Much to our surprise 'Bill' Young then produced cups of hot coffee for a present. This is a case of deeds not words as this had been discussed at the last Committee Meeting when it was decided to enquire into the possibility of providing coffee and biscuits at our other meetings. Mr. Young did

not wait for enquiries but got on with the job!

The Informal Dinner and Social Evening

This took place on the 21st February at the Horse Shoe Hotel, Tottenham Court Road. Sixty-one people attended the event and all had a thoroughly enjoyable evening. Firstly they were fortified with a very good meal, then they spent the rest of the evening dancing to the sound of music provided by Direct Sound.

This dinner was a new venture for the Southern Section and the cause of many a furrow on the brow of Mr. Brench and Mr. White, for of course, the dinner must be ordered and Direct Sound booked and paid for no matter how many attend.

Many members who have attended in previous years were noticed by their absence. The Committee would like to know their reasons for not attending and suggestions for next year's dinner.

March Meeting

Mr. Dickerson of Leybold Heraeus gave a very interesting talk on Vacuum Techniques, despite the fact that he was suffering from the after effects of a chill.

It was pointed out that very little use is made of glass by Leybold Heraeus; the vast majority of their vacuum equipment being made in stainless steel. Mr. Dickerson stated that vacuum technology is little known but despite this modern technology has got where it is by the use of vacuum. Vacuum was first used for light bulbs. It is now used in radio and electronic valves, TV tubes and for making such things as plastic floor tiles, instant coffee, dried foods and tinned foods.

Torricelli produced the first vacuum in his mercury barometer (1608–1647): his name lives on in vacuum measurement – 1 torr = 1 mm. of mercury. In 1874 McLeod produced his gauge, this would measure a pressure of 10^{-3} torr. W. Gaede produced the rotary mercury pump; Pirani produced a gauge that measured pressure by using the resistance of a filament; Vogel produced the thermo-couple gauge. In 1910 Knudsen produced a gauge to measure pressure down to 10^{-6}. Around 1915 Langmuir improved the diffusion pump. The Ion gauge was produced in 1916 by Buckley; in 1928 oil diffusion pumps came on the scene. Bayard-Alpert improved the Ion gauge in 1956 so that pressures down to 10^{-16} could be measured. The cold cathode gauge has been produced and is capable of measuring down to 10^{-14}. More recently U.H.V. Ion pumps and mass spectrophotometers have come into use.

There are four regions of vacuum: 760 mm. of mercury to 1 Torr for handling devices such as chucks and lifting devices, and for vacuum forming equipment. Fine vacuum, 10^{-1} to 10^{-3}, is the range used for steel de-gassing, vacuum impregnating of transformers, dewars and vacuum distillation.

The 10^{-3} to 10^{-6} High Vacuum range is used for coating processes, valves, cathode ray tubes, vacuum heat treatment and vacuum brazing. Ultra High Vacuum 10^{-6} down, is used for special electronic tubes and studies in space research. The pressure in deep space is 10^{-19} and near space pressures of the order 10^{-14} can be produced.

Great efforts are being made by a large number of people to produce complete semi-conductor components in u.h.v. as one complete unit. Stainless steel is favoured in the construction of u.h.v. plant as it presents no contamination problems. With the same purpose in mind molecular sieve sorption pumps are used in order to avoid contamination from rotary pumps. Pressures 10^{-1} to 10^{-2} are achieved in this way. However, the Ion pump will not start at pressures higher than 10^{-3} and in order to bridge the gap Titanium sublimator pumps are used. These have a better effect and a very high speed of pumping – around 4,000 litres per second. Copper seals are mainly used as these produce a minimum leak rate and can be baked at 400°C.

Most contaminants are drawn off by the sorption pumps.

Vacuum is much used in packaging and processing food and its use in this field will grow, particularly as food can be stored in good condition after vacuum processing. Instant coffee is the most common food at the moment produced in this way. A very concentrated brew is squirted through nozzles into a vacuum chamber, the water is removed, leaving the coffee.

Vacuum packaging in polythene bags is used for meat and meat lasts for about one month when packed in this way. Food that has deteriorated is easily recognised when packed in this way as the bag blows up and is no longer a tight fit around the food.

A large number of important items are freeze-dried – some of these are blood plasma, mothers milk and some drugs. There is practically no damage to the item freeze-dried and it does not lose its size or shape. The products are first frozen and then the water is removed by vacuum.

A large production freeze drier is 6ft. in diameter and several hundred feet long. Trolleys can be wheeled through it.

Mr. Dickerson strongly recommended two new instant teas just coming on the market, saying that the quality is excellent.

A vote of thanks was proposed by Mr. Smurthwaite, who said that he had found the talk most interesting.

The attendance at this meeting was moderately good, 26 members being present.

April Meeting

The talk on Natural Gas Burners by Mr. Thomas of Richoux Ltd. did not take place but it is hoped to arrange another date in the future. In its place the members present held a general discussion, the main topic being whether the Society should issue pay scales for glassblowers. Many points of view were expressed but no firm conclusion reached except that it would be difficult to devise a single scale to cover widely different skills and types of work.

T. J. MAPLE

Midlands Section

Visit to the Chemical Glass Plant Section of Messrs. Quickfit and Quartz Ltd., Stone, Staffs.

Mr. Donald Curtis, Technical Director of Quickfit and Quartz Ltd., welcomed the members of the Midlands Section in the Reception of the Main Offices Building at 3.0 p.m. on 7th March 1969. He briefly outlined the operation that was to be seen in the Chemical Plant Section and mentioned some of the techniques which had been developed to overcome construction difficulties. Several members of the B.S.S.G., employed at Q. and Q. assisted Mr. Curtis in conducting the visitors through the workshop. Highly skilled operators were seen forming "pancake" coils by hand to a very close gauge tolerance. These coils were then assembled into batteries and then hand-torched into the 18 inch diameter heat-exchange jackets. Work seen in the gigantic lathes included 18 inch diameter joins and T-pieces, the latter utilising special angle jigs. This large tubing was in the form of blown blanks, the closed or the "pipe" end was cut off either in a section of the workshop, specialising in cutting-off glass, or was cut off after setting up in the lathe. One lathe operation which radiated considerable heat was the heating of the 18 inch "pressing ends", and reforming so that they would conform to the high standard of accuracy demanded by Q. and Q.

Examples were seen of 24 inch diameter apparatus which had been manipulated and assembled in the department, also flasks up to 200 litre capacity which had been "worked" in the lathes. The various "letting-down" ovens, annealing ovens and lehrs were all in proportion with the outsize in apparatus being manufactured. The three largest annealing ovens were of particular interest, being arranged so that they could be positioned over alternate bases, being lifted with a travelling gantry hoist. One base was loaded with apparatus to be annealed, while the oven was in position over the next base which had been previously loaded for annealing.

The grinding workshop of the department was equipped with various ingenious devices to combine the safety of the operator with means of holding the glass while grinding the ends of "pressings" on apparatus up to 24 inches in diameter. The horizontal flat grinding mills were about 3ft. in diameter and fed with abrasive-water slurry.

The group gathered afterwards in the Restaurant, where, over refreshments, Mr. Curtis and Q. and Q. members answered questions on the organisation, working conditions, techniques employed in glass handling, also the problems anticipated with the introduction of natural gas and the types of burners which might be successfully used with the gas.

Mr. Cookson expressed the thanks of the Midlands Sections to Mr. Curtis for the facilities afforded for the visit and the interest which Mr. Curtis has shown in the B.S.S.G. on this and past occasions. Our host expressed his pleasure for the occasion and wished the Society continued success.

A Special General Meeting was arranged to follow the visit and commenced at 6.0 p.m. Fourteen members and four visitors were present and six apologies were received for absence.

Mr. S. Yorke opened the meeting by explaining the reason for calling the Special General Meeting which was because of the poor response to the Annual General Meeting, held at Warwick University on the 24th January 1969.

No member present was prepared to accept office, so Mr. Yorke then offered to continue as Acting Secretary for a trial period to encourage the members to keep the Section alive and invited proposals for future activities which could be envisaged for the Section.

OBITUARY

Wilhelm Anton Richter, 54 years of age and a member of the Midlands Section since 1964, collapsed and died at his home in Stafford on 24th May 1969.

Mr. Richter joined Quickfit & Quartz Ltd., on coming to the United Kingdom in 1939 with a party of refugees from Czechoslovakia, which was his native country. Quickfit & Quartz was then a subsidary of Triplex Glass Co. in Kings Norton, Birmingham. Although the Company has expanded considerably since those days, Will Richter will always be remembered by the Management and his colleagues for his untiring efforts and invaluable contribution to the development of the high standard of quality attributed to Q & Q products.

Will Richter was also known personally to many Midlands members who wish to extend their deepest sympathies to his wife and relatives in their sad loss.

S. G. YORKE

Thames Valley Section

On the 3rd April the section met at Reading University to hear a lecture by Mr. M. O. Bartle of 20th Century Electronics Ltd., on Cathode Ray and Geiger Müller Tubes.

This was a very practical talk in which Mr. Bartle likened the Cathode Ray Tube to an electronically-driven writing stick. In turn, he dealt with the materials and their required qualities, fabrication methods, tolerances, problems and mechanical and electrical safety. Many of the glass construction processes were described in detail before going on to phosphor deposition, lacquering, aluminising and vacuum processing.

Geiger tubes were similarly described and numerous samples of components and tubes were available for inspection.

A lively question time followed, with our speaker able to give down-to-earth answers of practical value. I feel sure that Mr. Bartle will never speak to a more appreciative audience.

The final fixed meeting of the 1968/69 season was held at the Clarendon Laboratory, Oxford. It was a splendid evening.

Mr. Williams of Jencons (Scientific) Ltd., gave us a completely surprising non-commercial talk on glass and glassblowers. He gave us some history of glass interposed with touches of humour plucked from many sources – including the Bible – and practical facts, difficulties and inventions which have made possible present day glass, and indeed, many up-to-date world achievements.

However, the words which ran theme-like throughout this talk were "the scientific glass-blower should take care not to devalue himself". Surely a message we should not disregard. Mr. Williams added to his surprise packet by suggesting that the scientific glassblower should develop an interest in other types of glass, and urged the consideration of organised visits to museums which house famous glass collections, both at home and abroad. This interest was stimulated by the superb pieces of glassware, from paper-weights to drinking glasses, which he had brought from his personal collection for our inspection and delight.

Finally, a quick drink at the 'local' turned into a sit-down supper and conversation on many facets of glass and glassblowing.

Our thanks to Mr. Williams for his talk, his wit, his hospitality and his interest in us and our material beyond the stage of commercialism.

Without any doubt, this has been Thames Valley Section's finest lecture season, and as their reporter, I must record the members' sincere thanks to the programme organisers. S.D.F.

Western Section

At the request of some seven members a meeting took place at which Mr. F. G. Porter accepted the office of Section Chairman and Mr. M. Fowler of the Biochemistry Dept., University of Bristol, agreed to act as Secretary.

A committee was also formed and it is expected to resume technical meetings for the section in the autumn. Meanwhile, a visit to Messrs. Jencons Ltd. arranged for 30th June was successfully carried out.

Change of address

Mr. E. White now at 95 Buckingham Gardens, Hurst Park, West Molesey, Surrey.

Chairmans New Appointment

It may interest members to know that Mr. E. G. Evans has taken a new appointment as Technical Advisor to Day-Impex Ltd., Colchester. whose products include Dewars, glass to metal base and pinch seals.

1969 SYMPOSIUM

Technical Films

A series of eight technical films has been hired from the American Scientific Glassblowers Society for showing at this year's Symposium, to be held on the 19th–20th September at Clacton-on-Sea, Essex.

The films will be shown in two sessions, before lunch on Friday and before luuch on Saturday.

1) *Window Sealing*
   Flame and R.F. Induction sealing.
2) *Glass to Metal Seals*
   Copper to Borosilicate, Kovar to 7052 and EN 1, Tungsten to quartz.
3) *Ceramic to Glass Seals*
   Ceramic to glass – quartz graded seals.
4) *Alumina Silicate Glass in Electron Tubes*
5) *Glass Bellows*
   Internal and External Bellows.
6) *Workshop Hints*
   Silvering, winding coils, cutting large tubing, quartz fibres, cutting thin wall bulbs.
7) *Aluminium Deposition and Vertical Sealing*
8) *Precision Glassware*
   Precision bore tubing – vacuum sealing.

Accident Insurance

At the direction of Council I have enquired of a leading insurance company with the intention of starting group accident insurance within the society (however caused). In units of 30/– shillings a year members can cover themselves for:

Death resulting from accident	£1000. 0. 0
Loss of one or more eyes or limbs	£1000. 0. 0
Permanent total disablement	£1000. 0. 0

Members may take as many units as they wish to fit the needs of the individual and to enable this low premium to operate we would have to collect the money ourselves and pay direct once a year.

Would interested members please return the completed slip to me.

I would like to have further information on the proposed group accident insurance and would want..... units at a premium of.....per year.

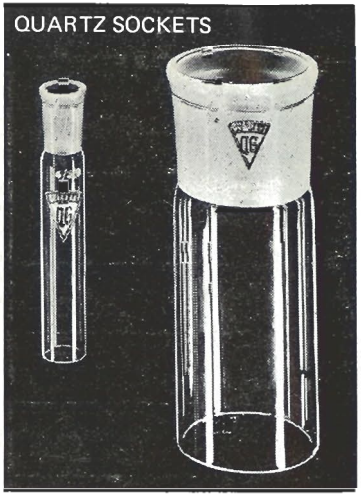
Name .....

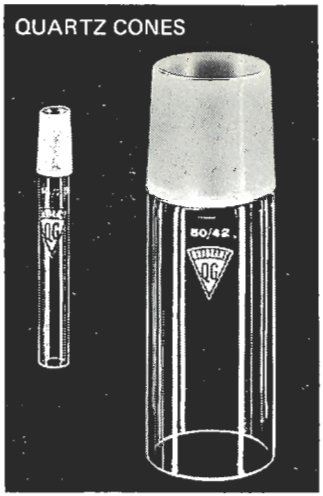
Address .....

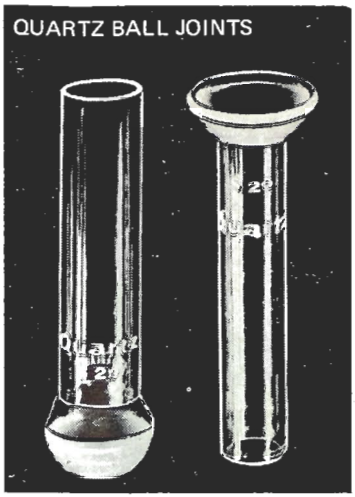
.....

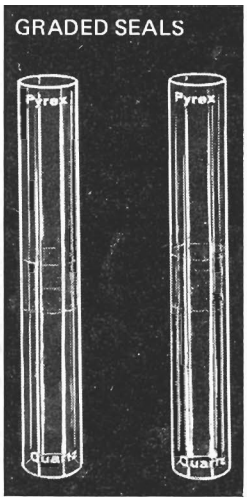
.....

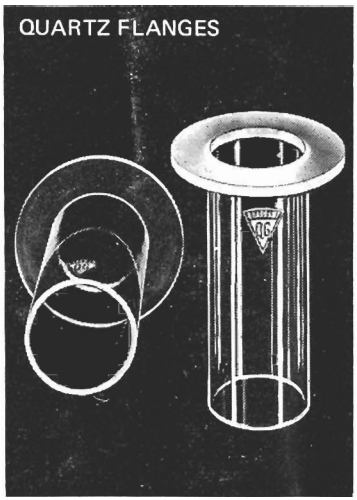
to L. V. BENGE, 75 Birchen Grove,
Kingsbury, London, N.W.9.

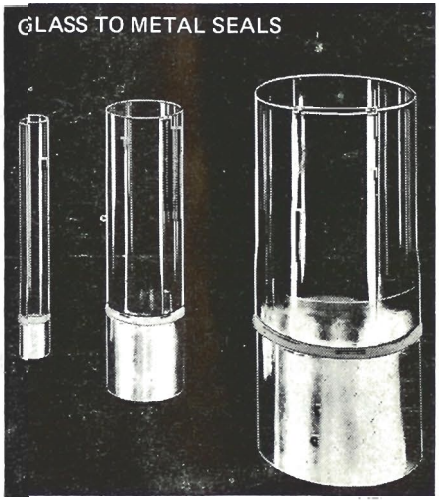












Quadrant 'Standards' in regular demand

Variations to these "Standards" are readily available - let us quote for your special needs.

QUADRANT GLASS CO. LTD.

The Pinnacles, Harlow, Essex

Tel: Harlow 21315