

302. *The Laboratory Production of Sintered Glassware.*

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IN view of the increasing use of sintered-glass filter plates in laboratory apparatus, a method is now described whereby they may be prepared quickly and simply by anyone of average skill in glass-blowing.

The most suitable glass for the purpose is undoubtedly "Pyrex"; if other kinds are used, much more care must be taken both in the preparation of the plate and also in annealing the whole apparatus after the plate has been sealed in. When working with "Pyrex" glass, however, no annealing is necessary, and the sealed-in plate withstands, for instance, the frequent and considerable changes of temperature to which it is subjected in the microsublimation apparatus.

"Pyrex" glass is powdered in an iron mortar until it passes a 60-mesh sieve. The powder is boiled with hydrochloric acid until the rust and dirt have been removed and it is quite white. It is then placed on an 80-mesh sieve and the finer particles are removed by prolonged washing and stirring. After draining on a porous tile, a little of the powder is moistened with a concentrated solution of commercial sodium silicate (water-glass). It is important to use only the barest minimum quantity of this binding agent, as every trace of it must be removed before the plate is finally sealed into the apparatus. The quantity required is merely that which is just sufficient to prevent the moulded plate from disintegrating during the preliminary heating of the sintering process, *i.e.*, about 0.05 c.c. for 3—4 g. of glass powder. The powder is then moulded as follows: A brass tube (very conveniently a cork-borer) is chosen of the desired diameter, and a tightly fitting brass rod is inserted in it so as to form a cavity of the desired depth at one end, into which the prepared glass is pasted. This implement is then inverted over a porous tile, and considerable pressure applied through the plunger, which is for this reason left longer than the tube. When this has been done, the moulded plate is carefully detached on to a charcoal block by pushing and twisting the plunger. Without further drying, it is heated on the charcoal block, first gently with a smoky flame and afterwards with the full heat of the hand blowpipe flame.

The heat of the slowly burning charcoal block affords a convenient means of conducting the preliminary heating of the bottom and the sides of the plate, but the sintering process

is finally completed by turning the plate over and repeating the treatment given to the top. With "Pyrex" glass, it has not been found possible to fuse the powdered glass completely in an ordinary blowpipe flame, although, as might be expected, it is possible to modify appreciably the porosity of the finished plate by varying the intensity of heating during the sintering process. With powdered glass of the size mentioned, and moderately strong heating, the porosity of the finished plate approximates closely to that of the grade i.G.3. of the Jena classification.

After cooling, the plate is boiled with water for some time to remove all traces of sodium silicate, and on drying is then ready for sealing into the length of tubing in which it is to be used. This operation is straightforward, and it may be said that the success or failure of the whole process is entirely dependent on the amount of sodium silicate used as a binder. If too little is used, the plate will crumble during sintering; if too much, the composition of the glass is so much altered that trouble will be experienced with "cracking out" of the plates after sealing. A little practice, however, will speedily enable the worker to decide on the correct amount of silicate and acquire the limited skill necessary in making sintered diaphragms which are perfectly satisfactory in use.

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