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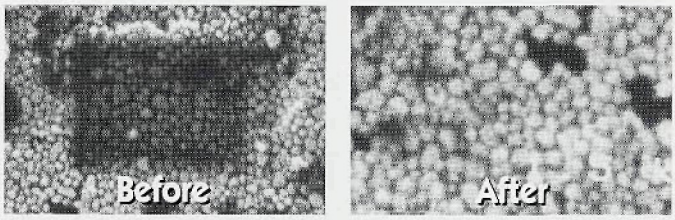

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Microdroplets of Liquid
Part I: Glass Fiber Brush

Walter C. McCrone, McCrone Research Institute*

It is very important to be able to deliver tiny droplets of liquid onto any surface. There are two general methods for this. One, a glass fiber brush sealed into a capillary; and, the other, a polyethylene micropipette. Both are capable of delivering droplets as small as 100 μm in diameter. Description of the glass fiber brush follows. Part II, later in this publication, will describe the polyethylene micropipette.

We have borrowed this clever idea from Fred Schneider of IBM (private communication). A bundle of 20 to 30 glass fibers, 5 to 8 mm long and about 20 μm in diameter, is sealed with a microflame into one end of a glass capillary. A melting point capillary 1 to 2 mm in diameter and open at both ends is convenient (Fig. 1). To use for small drop deposition, the capillary is partly filled (2 to 3 cm. long column of the desired liquid) so that the sealed-in end of the glass fiber bundle is fully immersed. Droplets can then be "painted" onto any surface by touching the glass fiber "brush" to the desired spot. Drop size depends on the number and size of glass fibers, the liquid head in the capillary, the splaying of the fiber brush on the surface and any movement of the brush across the surface.

Normally, the glass fiber brush is used with pure liquids because evaporation concentrates a solution on the brush and may clog the fibers. This effect can be alleviated if the solution-filled capillary is stored with its brush tip

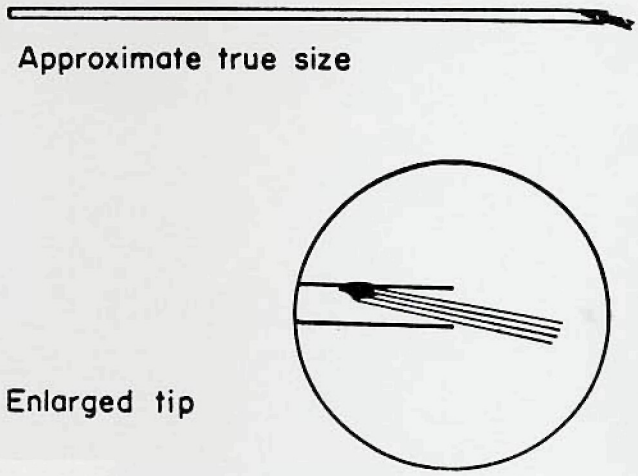

Figure 1: Glass fiber brush for deposition of microdrops.

in a bottle or test tube containing a little of the appropriate solvent soaked into a cotton ball at the bottom (Fig. 2). Evaporation from the open end of the capillary is very slow, negligible over a period of several hours, and can be minimized further by drawing down the open end of the capillary to a very fine opening. In this way, a dilute solution of, say, collodion can be kept ready for

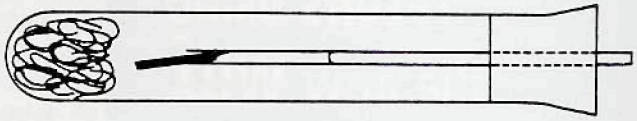

Figure 2: Protective container for glass fiber brush; a glass wool plug in the bottom of the test tube is soaked with solvent.

instant use for days and even weeks. It is essential that the brush end of the capillary be stored in the saturated solvent vapor corresponding to the solution used. Strictly speaking, one would avoid small concentration changes due to differences in vapor pressure if the brush tip is stored over the same solution rather than over the pure solvent. ■

* *Reprinted from The Particle Atlas, Volume 1, available from McCrone Research Institute, 2820 S. Michigan Ave., Chicago, IL 60616, Tel.: (312)842-7100. The entire six-volume Particle Atlas is also available on CD-ROM.*