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Note

Silica gel particle size and coating thicknesses of Chromarods-S and -SII

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The Chromarod–Iatroscan thin-layer chromatography–flame ionization detection system has been established as a convenient and accurate means of separating and quantitating a variety of less volatile organic compounds[1]. Chromarods are universally quartz rods 0.9 mm in diameter and 150 mm in length, but three different coatings are available, basically S (silica gel), SII (finer silica gel) and A (alumina). All the coatings are held in place with a soft glass frit. Only one illustration, made several years ago, of the rod and coating has been published[1], and this note is to clarify the difference between Chromarods-S and -SII.

At low magnifications the surface appears as a smooth white layer but is clearly not absolutely homogeneous as there may be slight imperfections visible such as longitudinal furrows, minute white spots, presumably denser aggregates of silica, and occasional small pits, the latter perhaps being derived from the collapse of small bubbles. In actual fact the mass production of surprisingly uniform Chromarods is a significant achievement and these minor imperfections have never seemed to interfere with separation efficiency.

Some recent high magnification microscope photographs, courtesy of Iatron Laboratories, Tokyo, Japan, show that the silica gel of the Chromarod-S is relatively inhomogeneous in mesh size. Fig. 1 shows a section including the quartz rod and emphasizing the thin layer essential for both efficient chromatographic separation and efficient heat transfer. In Fig. 2 the actual surface is shown at the same high magnification. Both show that the numerous small particles of about 2–5 μm in diameter are interspersed with occasional larger chunks up to 10 times as large. Chromarods-SII show, in comparable figures, a section at lower magnification (Fig. 3) and a surface (Fig. 4) at the same magnification as Fig. 2. Two observations emerge from these comparisons. The first is that the coating thickness is virtually the same for the Chromarod-SII when compared with the Chromrods-S (32 μm). The second is that the silica gel mesh size is much more uniform for the Chromarod-SII (Fig. 4) than for the Chromarod-S (Fig. 2).

In our laboratory work[2–4] we originally[5] used Chromarods-S, but in time have changed to Chromarods-SII, primarily because of superior reproducibility in most separations. The reported large difference in efficiency between the two layers of Chromarods[1] was never realized in our lipid work. The mesh size in the Chroma-

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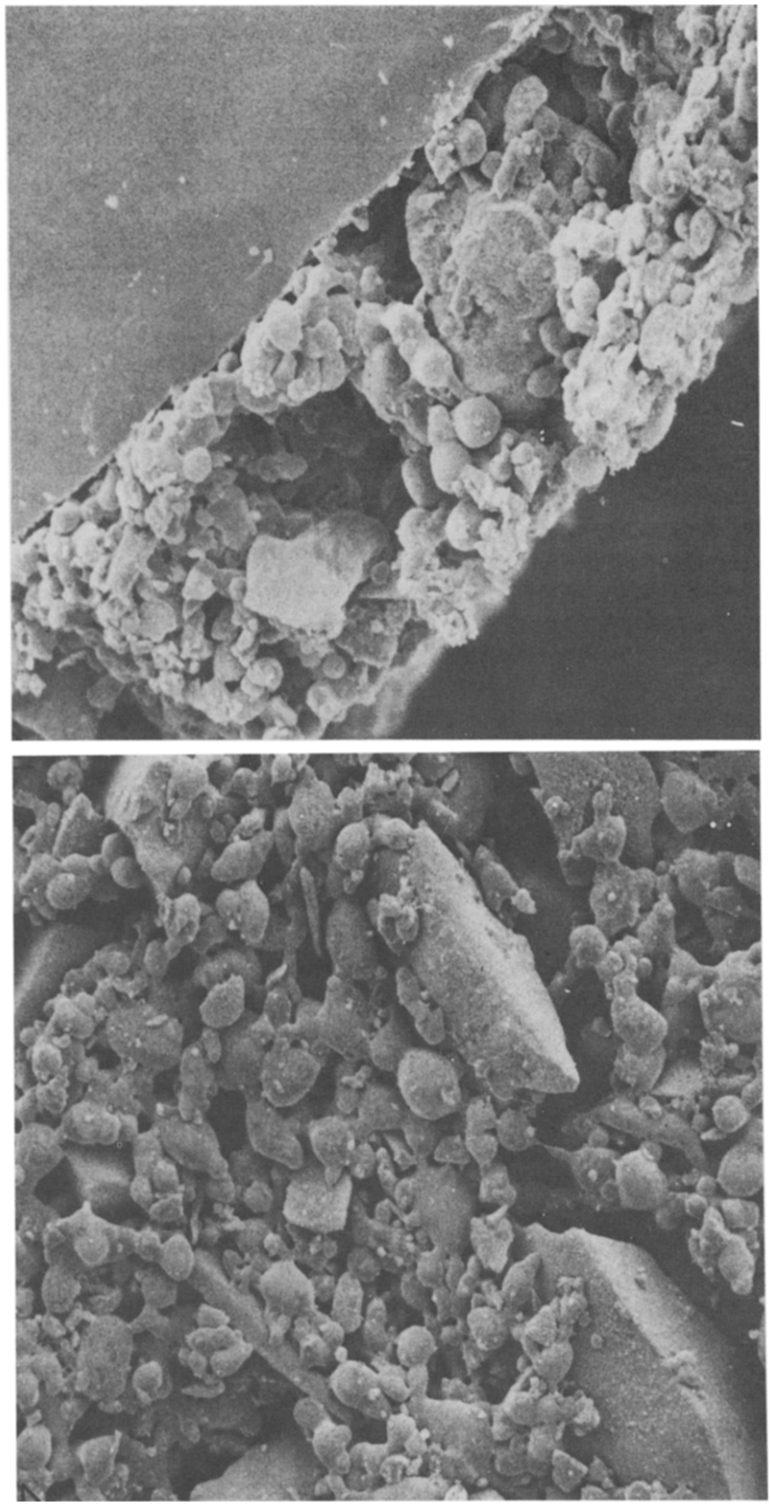
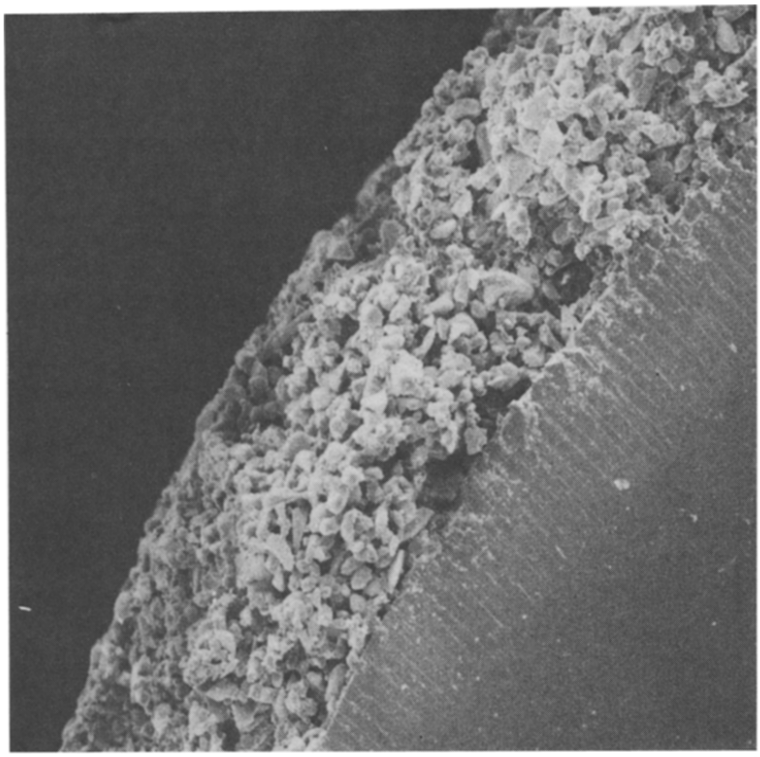


Fig. 1. Section of Chromarod-S. Quartz rod is in upper left. Magnification, × 1500.

Fig. 2. Surface of Chromarod-S. Magnification, × 1500.



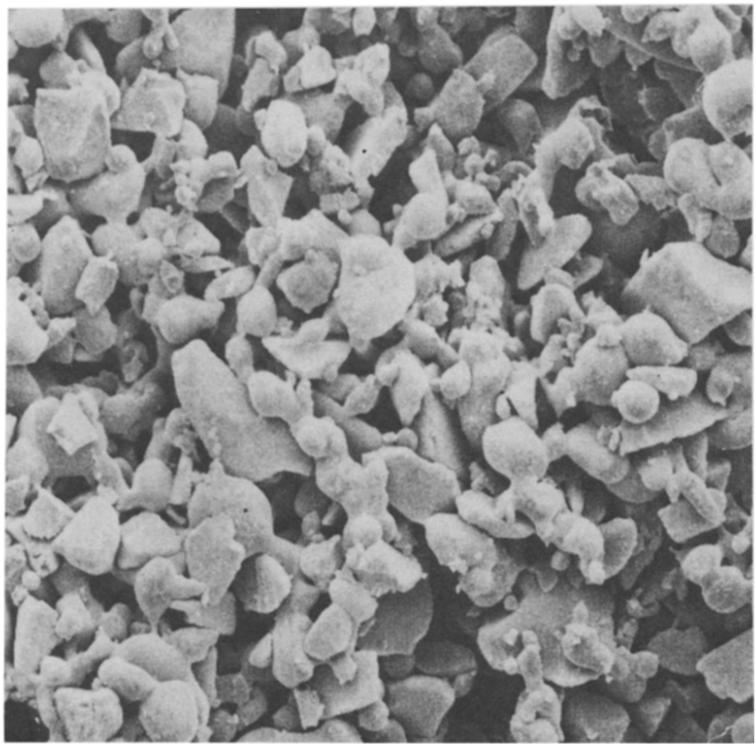


Fig. 3. Section of Chromarod-SII. Quartz rod is in lower right. Thickness of silica get layer is 68 μm. Magnification, × 500.

Fig. 4. Surface of Chromarod-SII. Magnification, × 1500.

rods-SII may be slightly larger, more typically 5 μm in diameter compared to some of the gel in the Chromarods-S, but the more uniform mesh size must permit better packing and improve chromatographic properties. A more even coating may also be partly responsible, and a thicker coating on Chromarods-S might offset the partical size irregularities. In terms of cost and number of useful scans, at least several hundred per rod[4], there is little advantage in not using the Chromarod-SII. In the previous report[1] on silica gel coatings the thickness and particle size for Chromarods-SII were approximately correct but those for the Chromarod-S were incomplete as the average particle size was given. The coating thickness may vary with production runs.

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