Executive, of the Ministry of Defence. It weighed 18 kg and took one sample every sixteen seconds in a cycle of operations which involved the use of motor driven valves.

Cycle Time Reduced

Although later developments reduced the cycle time of this equipment to eight seconds this was still considered too slow, and Pye Dynamics undertook the development of an improved version for civil use. Gas switching in this new instrument is by fluid logic and all the active components, including the E.C.D., are incorporated in drillings in a block of P.T.F.E. Attention to detail design has brought the weight down to 10 kg, and the equipment is now housed in an easily carried unobtrusive brief case (Figure 2). Improved electronics enables the response to be shown on a digital display. Most important of all, however, is the cycle time; this is now three and a half seconds, made up of two seconds for sampling and only one and a half seconds for analysis.

It is a sorry commentary on the state of the world today that this equipment is meeting with substantial commercial success. It is also true that its excellent performance depends entirely on the unique surface properties of a short length of platinum wire.

Control of the Penetration of Platinum into Alumina Pellets

Small cylindrical pellets of alumina are frequently used as supports for noble metals to be used as catalysts in fixed bed reactors. It has been known for some years that the observed efficiency of such catalysts depends upon the location of the metal within the pellet, and for many reactions it has been believed that a very thin layer of metal close to the pellet's surface produces optimum results. Recent theoretical discussions (1, 2) have led to a clearer understanding of the importance of the concentration profile of the metal through the pellet: if the reaction has an overall positive order it is better to have the metal near the surface, but if it has an overall negative order then it is preferable to concentrate the metal towards the centre of the pellet.

Such theoretical considerations are of little value unless they can be put to experimental test, and for this purpose a means of controlling the location of the metal within the pellet is needed. A striking instance of how this can now be done is provided by the recent work of T. A. Nuttall (3) working in the laboratories of the Council for Scientific and Industrial Research at Pretoria in a report on "Catalysts with Sub-surface Active Layers Prepared by Co-impregnation". Nuttall used the method of competitive adsorption, by taking solutions of chloroplatinic acid containing various concentrations of citric acid. The citric acid or the citrate ion apparently adsorbs in competition with the chloroplatinate ion on the active centres on the alumina surface, so that the higher the citric acid concentration, the further the chloroplatinate ions can penetrate. In this way it proved possible to produce pellets in which the platinum after the reduction either was close to the surface, this being described as an "egg-shell" catalyst; or was confined to the centre of the pellet (an "egg-yolk" catalyst); or was located in an intermediate zone (an "egg-white" catalyst).

The effect of other variables, such as time of impregnation, drying and reduction conditions, on the concentration profile were also examined.

Thus, with improved procedures for controlling the location of the metal within catalyst particles, the way is now clear to experimental tests of theoretical models, and hence to a better appreciation of the role of diffusion within the pores of catalyst particles.

G. C. B.

References

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