

From our experiences with this programmed automated process of coating it became readily apparent that it offered a number of advantages over the manual method of coating, the most significant ones being:

Tablets from a particular pan batch show uniform coatings relative to physical appearance and disintegrating properties.

Reproducibility of coating from batch to batch of tablets is insured.

The more even film coating deposited by this process produces enteric coated tablets with one-third or less the film weight necessary for manual coating procedures.

Using this process with the repetitive short spray-dry cycles of coating, no coating build-up on the pan wall takes place. This permits the continuous coating of batches of tablets without the need of washing the pans between batches.

The possibility of pimples forming on the coating is eliminated because no coating build-up on the pan wall results.

The time required to obtain enteric film coated tablets by the automated process is at least half that required for the manual process.

A manifold increase in production capacity is possible through this process of film coating.

One operator will be able to supervise the coating of many batches of tablets per day.

It is unnecessary to use an experienced tablet coater with this system of film coating.

This method of coating is adaptable for use with water-soluble films as well as sugar coating.

SUMMARY

A programmed automated process for film coating

has been developed which is capable of concurrently coating multiple pan batches of tablets containing 85-100 Kg. of tablets per pan.

As a result of eliminating the human element from the coating operation and consequently the so-called "art" of tablet coating, film-coated tablets prepared by the automated process show close reproducibility of coating from batch to batch of tablets as well as greater uniformity of coating within batches of tablets.

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Notes

Concentric Double Electrolytic Junction Calomel Reference Electrode

By NORMAN ADLER

AQUEOUS calomel reference electrodes are frequently unsuitable for use in titrations in acetic acid or acetic anhydride as they often lead to erratic potentials and drifting, irreproducible end points (1-4). These difficulties have been attributed to contamination of the electrode (3), to insufficient electrode-solution interfacial contact (1), and to changes in the liquid junction potential as the electrolyte flows from the electrode to the solution (4). Asbestos fiber-type electrodes, notoriously troublesome in nonaqueous titrations (4, 5), may be particularly prone to contamination. As the titration solution (often containing perchlorate ion) diffuses into the fiber, it mixes with

saturated aqueous potassium chloride. Less soluble potassium perchlorate may then be precipitated, thereby disturbing or breaking the electrolytic contact. Depending on the titration medium, the electrolyte may also be precipitated. A crust of precipitate has been observed to form at the tip of the fiber in contact with the titration medium (6). Fiber electrodes that become shorted or erratic during nonaqueous titrations may often be rejuvenated by soaking overnight in water.

The difficulties with aqueous electrodes may also be attributed to the nature of the electrolyte and the solvent used. The addition of water to the titration medium changes the nature of the system, often deleteriously (3). Water and the occasionally used methanol (7, 8) are not suitable for acetic anhydride systems as they undergo acid-catalyzed

acetylation reactions. Chloride salt electrolytes are also potentially troublesome.

When the titration medium contains mercuric acetate, the alkali chloride electrolyte flowing into the solution is quantitatively converted to a strong base (3). In the absence of mercuric acetate, titrable base is formed less rapidly by the volatilization of hydrochloric acid (9, 10). In both cases the effect is manifested by a slow drift of the E.M.F. back to the alkaline side of the end point and leads to erroneously high results. Since the rate of base production is not appreciable, the effect may be noticed only in the end point region of the titration where the rate of change of potential with acid concentration is at a maximum.

In view of these effects many workers (6, 11) have recommended either modified calomel electrodes or alternate electrode systems for use as the reference electrode in nonaqueous titrimetry. The modifications of the calomel electrode usually consist either of using various alternate electrolyte-solvent combinations (2, 7, 8, 12) in the built-in salt bridge of commercial calomel electrodes (single junction type), or of immersing the aqueous calomel elec-

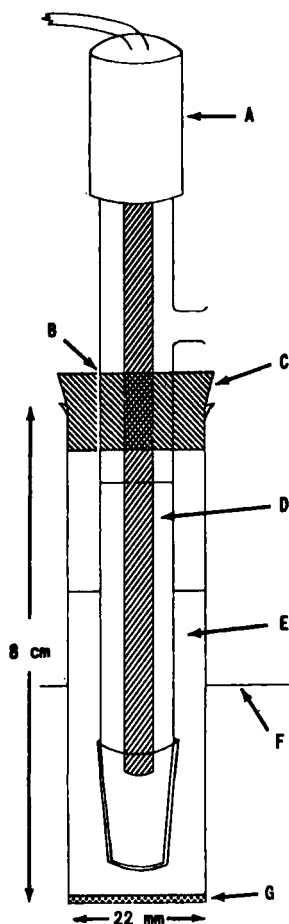


Fig. 1.—Concentric double electrolytic junction calomel reference electrode: A, Beckman sleeve-type calomel electrode, No. 1170-71; B, vent; C, stopper; D, saturated aqueous potassium chloride; E, saturated solution of potassium perchlorate in acetic acid; F, maximum insertion of electrode into solution; and G, porous disk.

trode in an external nonaqueous electrolytic bridge (double junction type). Various geometries for the external bridge chamber have been proposed (1, 4, 5, 11-13). The double junction type, although more complex, permits simpler troubleshooting in the event of electrode difficulties. Their higher resistance is ordinarily not a drawback if used with the high impedance pH meters currently available. In fact, Warner and Haskell (4) have successfully used acetic acid without added electrolyte as the solvent in the second bridge.

A convenient version of the double junction type is shown in Fig. 1. It consists essentially of a simplification of the Warner and Haskell design (4) to avoid the necessity of a special titration cell. The compactness of the concentric tube design permits this electrode to be used as easily as an ordinary calomel electrode in the conventional two electrode holders supplied with commercial pH meters. For titrations in poorly conducting solutions where the distance between electrodes may be important (14), the outer bridge may be further modified by placing the porous frit on the side of the tube facing the glass electrode. When not needed for nonaqueous work, the aqueous calomel electrode may be easily removed, and, after rinsing, immediately used for aqueous titrations.

The porosity of the fritted disk (Corning Glass No. 37730, Allihn tube with fritted disk, 30F, 20 mm. diam., 100 mm. height, is cut flush with the disk and to a height of 8 cm.) is adjusted by flame treatment to give a flow rate of less than one drop/hour for a 2 inch head of electrolyte. Acetic acid saturated with potassium perchlorate is used as the electrolyte in the outer bridge. Introduction of reasonable amounts of this electrolyte into the titration system is without effect. As indicated in Fig. 1, the relative levels of the electrolytes in relation to the solution are arranged to give a positive outward flow, thus minimizing the possibility of electrode contamination by inward diffusion of the titration medium. Monthly changes of inner and outer electrolytes are usually sufficient to keep the electrode working properly. In use, the electrode equilibrates rapidly to give stable potentials of the same magnitude as obtained for other calomel reference electrodes. (A fresh aqueous fiber type, a sleeve type filled with lithium chloride in acetic acid, and the above type, gave the same potential within 10 mv. when measured against the same glass electrode in the same solution.) The concentric tube electrode has been in satisfactory use for many years in this laboratory.

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