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The effect of intagliation shape on the incidence of bridging on film-coated tablets

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In recent communications (Rowe & Forse 1980, 1981) results were presented to show that bridging of the intagliations or monograms on a film-coated tablet was a manifestation of the stress distribution within the film and occurred when the stresses inherent in the film due to shrinkage on evaporation of the solvent were very high. It was also shown that the incidence of bridging could be minimized by decreasing the thickness of the film (Rowe & Forse 1980) and by using a plasticizer with a strong affinity for the polymer (Rowe & Forse 1981). Both these approaches are directed towards minimizing the stresses due to shrinkage ignoring methods of increasing the adhesion of the film to the substrate. This second approach is more difficult since the intrinsic adhesion at the film/substrate interface is dependent on the materials used to formulate the tablet and hence attempts to increase the adhesion will necessarily result in reformulation of the core. However, the adhesion at any film/tablet interface is directly dependent on the interfacial area of contact (Fisher & Rowe 1976), implying that if the surface area within an intagliation were increased, the incidence of bridging would then decrease. Some evidence for this can be seen from photographs (Rowe & Forse 1980) where the larger deeper intagliations on the tablet appeared clearer than the smaller shallower ones. This hypothesis has been tested further using tablets intagliated with two different intagliation shapes and coated under the same conditions with the same film thickness.

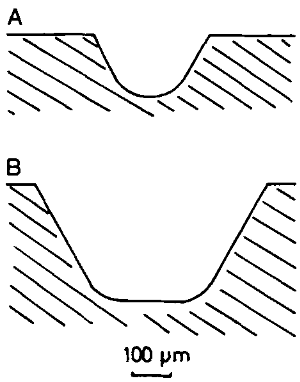

FIG. 1. Profiles of the two intagliation shapes.

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The two intagliation shapes are shown in profile in Fig. 1. Intagliation A is equivalent to the "AT" of "COATING" on the Manesty test coating punch (Manesty Machines Limited) as depicted in previous photographs (Rowe & Forse 1980). Intagliation B has the same angle and width: depth ratio as intagliation A except that the width and depth are both double that of intagliation A (i.e. the total surface area of intagliation B is approximately four times that of intagliation A assuming the same height of letter). The tablet substrate was the same as that used previously (Rowe & Forse 1980, 1981). The tablets were coated with a film formulation consisting of a 5% w/v aqueous solution of hydroxypropyl methylcellulose (Pharmacoat 606-Shinetsu Chemical Co., Japan) to which was added glycerol (20% w/w based on polymer). Film coating was carried out in a 24 inch Accelacota (Manesty Machines Limited) using an airborne spray system at an application rate of 50 ml min^{-1} and inlet air temperature of 60 °C. To assess the incidence of bridging, 1000 tablets were withdrawn at the end of the run, visually inspected and the number with any signs of the defect counted and expressed as a percentage.

The incidence of bridging on tablets with intagliation A was 85·3% compared with 55·0% for those with intagliation B confirming the hypothesis proposed. Four repeat runs using tablets with intagliation B gave a mean ($\pm$ standard deviation) incidence of 58·2 $\pm$ 15·7%.

The results lend further support to the concept of stresses in the film being the cause of bridging of the intagliations seen on coated tablets and show that the incidence of this defect can be significantly reduced by careful selection of the intagliation shape.

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