

ASSESSMENT OF THE WETTABILITY OF PHARMACEUTICAL POWDERS USING COMPRESSED DISCS

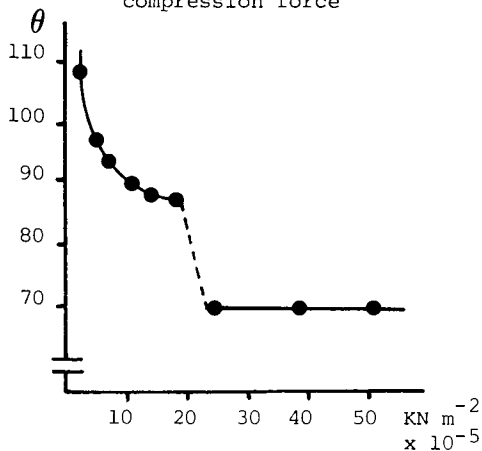
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The wetting of pharmaceutical powders is an important process in formulation and dissolution of dosage forms. A method of assessing the contact angle (θ) of a powder by preparation of a compressed disc and measuring the maximum height attained by a drop of liquid, was proposed by Heertjes and Kossen (1967). Fell and Efentakis (1979) observed that direct measurement of the contact angle formed by the liquid on the compact produced comparable results to the drop height method.

In a study of the wettability of amylobarbitone, 5 cm diameter compacts were prepared, as described by Heertjes and Kossen (1967), in stainless steel dies using a highly polished punch mounted in a hydraulic press (Dartec M2501). The nominally flat powder surfaces produced stood just proud of the die. A saturated solution of amylobarbitone in triple distilled water from an all glass apparatus, was added in 10 μ l drops using an Agla syringe. The drops were added to three different positions on the powder surface of each of three replicate beds, which had been saturated previously to prevent penetration. To ensure consistency, the drops were photographed immediately after being introduced to the surface, this prevented the variation of θ with time reported by Stamm et al (1984) and others. The contact angles were measured from the photographs by the method described by Neumann and Good (1979) and a mean value calculated. Standard deviations ranged from 6.0 to 15.7. The procedure was repeated on beds prepared with compression forces ranging from 2.5×10^5 KN m⁻² to 51.0×10^5 KN m⁻². The contact angles obtained are shown in figure 1.

From the results it can be concluded that the value of θ obtained from measurements on compressed discs will vary with compaction force. There is a limiting minimum value of θ beyond which further compression produces no further reduction. This is due to a plastic deformation producing a 'skin' on the

Fig 1. θ as a function of compression force



surface of the compact. Values of θ obtained from low compression forces seem to be affected by the loose powder on the surface, as this powder is incorporated into the compact a plateau is reached, however this is significantly different to the final minimum value of θ which is obtained due to a change in surface energy after a critical compression force has been applied.

It can be concluded that values of θ obtained from heavily compressed discs of powder, as used by previous workers, are a measure of a different surface energy to that of the original powder, and thus for many applications are not an appropriate measure of wettability.

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 Stamm, A., et al (1984) *Drug Dev. Ind. Pharm.* 10: 381-408
 Neumann, A.W., Good, R.J. (1979) in Good, R.J., Stromberg, R.R., (Eds.) *Surface and Colloid Sci.*, Vol. II, Plenum Press, New York, pp 31-91