RELATIONSHIP BETWEEN THE PHYSICAL AND MECHANICAL PROPERTIES OF WET GRANULATED MICROCRYSTALLINE CELLULOSE FOLLOWING DRYING

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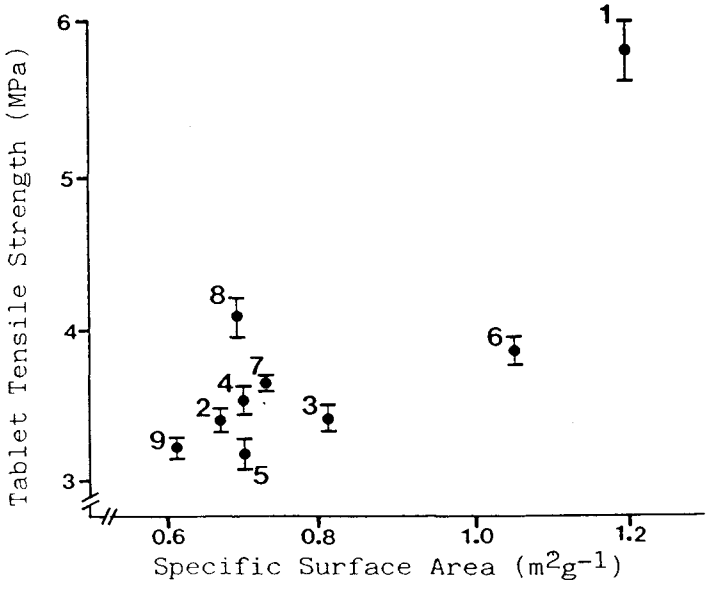
It is known that wet granulation of microcrystalline cellulose (MCC) results in a reduction in tablet compactibility, the degree of which is dependent on the drying technique employed (Chatrath & Staniforth 1990). Pesonen and Paronen (1990) have reported a direct, although non-linear relationship between the particle surface area and tablet strength for four directly compressed cellulosic materials.

In the present study, physical characteristics including B.E.T. surface area were compared with the compaction characteristics of MCC granules dried using several different techniques. The drying techniques used have been described previously (Chatrath & Staniforth 1990). Granules were prepared in a high-speed mixer/granulator. The ratio of MCC : water used in granulation was 10 : 6. All granule characterisations were carried out on size-standardardized material, the ungranulated powder being tested as received. Tablets were prepared from each granule type and from ungranulated MCC at a series of compaction forces, and the tensile strength of 10 tablets prepared at each force determined. Although similar relationships hold at other forces, the data in Fig. 1 shows the strength of tablets interpolated from a compaction force of 15kN with respect to B.E.T. surface area of the starting powder/granules. It can be seen that granulation of MCC resulted in a marked reduction in the particle specific surface area together with a decrease in compactibility. However, no clear correlation between specific surface area and strength of tablets prepared from granules dried using different methods was found.

Other physical characteristics which have also been studied with respect to their influence on tablet compactibility of MCC granules dried by different methods include moisture content, degree of crystallinity, and porosity. However, as with surface area measurements, no simple relationship between any of these physical characteristics and tablet mechanical properties was found.

Fig. 1 Relationship between the B.E.T. specific surface area of ungranulated and granulated MCC dried using various techniques and the strength of tablets produced at 15kN.



Key:
1. Ungranulated MCC Granules;
2. Tray dried until "just dry"
3. Tray dried, "over dried"
4. Dried under ambient conditions
5. Vacuum dried
6. Freeze dried
7. Fluidised bed dried
8. Microwave-vacuum dried using "high" process type
9. Radiofrequency dried

Note: Error bars represent 95% confidence limits.

Chatrath, M., Staniforth, J.N., Drying Technology, In Press, May 1990
Pesonen, T., Paronen, P. (1990) Drug Dev. Ind. Pharm. 16 (1): 31-54