THE WETTABILITY OF POWDERS DURING FLUIDIZED BED GRANULATION

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The process of wet granulation is dependent on the wetting of the powder by the granulating fluid. In fluidised bed granulations this dependence is likely to be even more important due to the lack of shear. The effect of adding surfactant to a fluidised system was studied.

To create a poorly wetted system a 50:50 mix of salicylic acid and lactose was used. A 1kg Aeromatic fluidised bed was charged with 750g of powder suspended with air at 50°, 200 ml of a 5% w/v aqueous PVP solution was sprayed down onto the bed at a rate of 22 ml/min from a binary nozzle. The granules were dried at an inlet air temperature of 65° until the outlet temperature reached 50°. Sodium lauryl sulphate (SLS) was added in two modes a) to the powder in concentrations of 0, 0.5, 1, 2.5, 5 and 7.5% w/w and b) to the spray; granulating solutions with concentrations of 0.5 to 7.5% (wt. SLS/vol. granulating solution) were added. The actual concentrations of SLS in the final granules of b) were 0.13. 0.26, 0.65, 1.3 and 1.9% respectively.

The resulting granules were analysed as follows 1) particle size by sieving 2) rate of flow through a 9.5 mm circular orifice and 3) compressibility on a Manesty B3B machine instrumented to give compaction and ejection forces (no lubricant was added). These tablets were assessed for 4) crushing strength and 5) dissolution times using a rotating basket method. Also 6) the contact angle of a sessile drop of granulating fluid on the surface of compacts made from the powder mixes was determined. 7) A rough estimate of spray patterns was obtained by impinging the spray onto smoked paper which was subsequently photographed and enlarged.

Addition of SLS to the powder improved the granule produced. This was reflected in a linear increase in mean particle size from 155µm with no SLS to 306µm with 7.5%. Flow rate of the granules through the orifice also increased from 6.2 to 8.4g/s between the same limits. Similar changes were observed when SLS was added to the granulating solution. However, a slightly better improvement per total SLS added was noted in this latter case; this was thought to be due to the SLS affecting the properties of the spray. As the amount of SLS in the spray was increased the mean size of the droplets decreased with a corresponding rise in number. At high concentrations of SLS a fine mist was produced, the droplets of which were barely strong enough to mark the smoked paper. The suggested increase in wettability was confirmed by measurements of contact angles, which fell from 47° with no SLS to 10° with 7.5%.

Compaction pressures were measured during tableting and crushing strengths determined. With no SLS a strength of 18kg was recorded at 160MPa, with 0.5% SLS the maximum strength fell to 12.5kg at 120 MPa. At 1% and above all tablets showed similar strengths reaching maxima of 5-6kg at 80MPa. As would be expected the presence of SLS increased the rate of dissolution. With no surfactant the tablets had a t_{30} of 62min, with 7.5% SLS in the spray (1.9% in the tablet) the t_{30} was reduced to 35 min and at 7.5% in the tablet t_{30} was 18min.

In conclusion it can be said that the addition of SLS improves granulation in a fluidised bed by increasing wettability of the powder. There is also the added advantage of improved dissolution rates.