THE EFFECTS OF HYDRATION AND DEHYDRATION UPON THE COMPRESSIONAL PROPERTIES OF ANHYDROUS DEXTROSE

A N Patel*, N A Armstrong and T M Jones**, Welsh School of Pharmacy, UWCC, Cardiff. Present addresses: *SmithKline Beecham, Welwyn Garden City, UK, **Wellcome Research Laboratories, Beckenham, Kent, UK.

The manufacture of granular materials by a wet granulation technique frequently involves the addition of water and its subsequent removal prior to tablet compression. Such processing can exert signficant effects on the compressional properties of the granulate (Khan et al 1981). The aim of this study was to examine the effect of hydration and dehydration on the compressional properties of anhydrous dextrose. The effects on both tablet strength and consolidation were evaluated. Moisture was introduced into the anhydrous dextrose (180-250μm sieve fraction) by allowing it to equilibrate at various elevated humidities. Dehydration was achieved by exposing the wet dextrose (initial water content 9%) to a range of lower humidities. Water content was determined using Karl Fischer reagent. The powders were compressed on a Manesty F3 excentric press using 12.5 mm diameter punches over a range of forces. The values of the compaction parameters at 19KN were determined by interpolation. Tablet strength was measured on a CT40 tester. Tablet apparent density was assessed by measurement of tablet weight and dimensions after ejection from the die. Fig 1 [•] shows that hydration of anhydrous dextrose results in improved tablet consolidation up to a water level of around 9%. This is attributed to a combination of lubricant and plasticising effects of water on the anhydrous dextrose particles under compression (Patel 1986). Beyond the 9% water level, a significant reduction in tablet density was obtained which could be due to hydrodynamic resistance of water opposing consolidation. Dehydration of wet anhydrous dextose to lower water levels (Fig 1 [ ]) resulted in a progressive reduction in densification. It is interesting that for a given water level, the apparent tablet density value obtained following dehydration significantly differs from that achieved following hydration. A marked increase in tablet strength was also obtained as the moisture content was increased to 9% (Fig 2 [•]). Contributory factors could be the improved tablet consolidation and increased surface tension forces due to water. Dehydration of the wet dextrose to lower water levels produced fluctuations in tablet strength (Fig 2 [ ]). It is again apparent that for any given water level, the tablet strength values obtained after hydration significantly differ from those obtained following dehydration. In conclusion, tablet strength and consolidation of anhydrous dextrose tablets is dependent not only on the absolute water content, but also on the route by which that water level is achieved. Therefore it is essential that the processing of a solid either as a powder or granulate is kept constant if tablet properties are to be maintained.

Figure 1

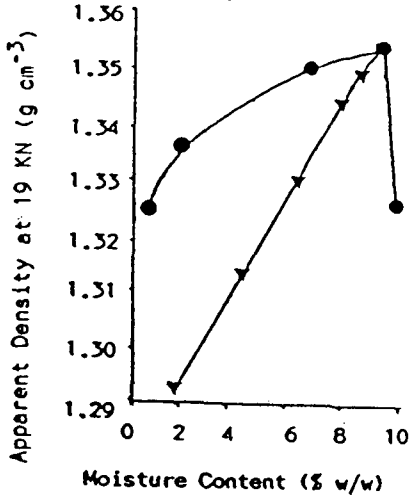
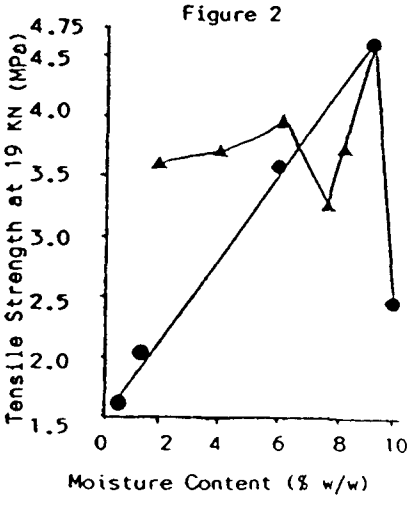


Figure 2



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