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Intragranular solute migration in a test granulation dried by fluidization and vacuum tumbler drying

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Intragranular solute migration has been studied in large masses of about 1 cm in diameter (Ridgway & Rubenstein, 1971) but little work has been done using granules of a size used in practice.

Test granulations were prepared by wet massing heavy kaolin B.P. (200 g) with 50 ml of sodium chloride solution (10%*w/w*) equivalent to 26·0 mg of salt per g dry weight. Wet granules from a sieve mesh 2800 μm were dried in a laboratory fluid bed dryer or in an evacuated vessel rocked back and forth in a water bath at 50° to simulate vacuum tumbling drying (Goodhart, Draper & Ninger, 1970).

The dry granules and dust from the bag filter were separated into fractions on sieves ranging from 2057 to 45 μm in aperture and the intragranular migration in the two larger sizes examined by prolonged sieving on a 250 μm mesh sieve and determining the salt content of the abraded powder at intervals (Fig. 1A and 1B).

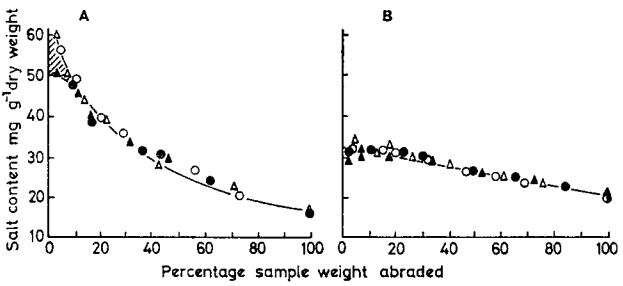

FIG. 1. Percentage sample weight abraded at different salt contents. A, granules dried by fluidization; △2057 μm and ○ 1680 μm mesh, both after 30 min drying; ▲, ● same fractions after 8 h drying. B, granules dried by tumbler drying (30 min), same sized fractions as in A, two separate batches ○●, △▲.

The mean solute content of the granule fractions was found from a crushed sample of each. The granules dried by fluidization lost about 4% of their calculated salt content. This loss appeared as an enrichment of the finer dust in the bag filter and that passing through 53 and 45 μm mesh assayed 35·5 and 44·1 mg of salt per g dry weight respectively. The vacuum dried granules yielded similar quantities of fine dust but the same fractions contained only 27·3 and 27·9 mg per g dry weight and the granules were close to the calculated salt content.

Prolonged fluidization caused little further change in the solute profile of the two largest sizes and the solute loss after 8 h (equivalent to the cross hatched area of Fig. 1A) was about 3% of the content after 30 min drying.

It is therefore concluded that the main loss occurs by abrasion of the solute rich outer layers in the early stages before the granules develop their full dry strength.

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