Comment of the Cover Photograph Seeded Granulation

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Fig. 1a X-ray micro-tomographic image of the central cross section of a granule.

Fig. 1b For front cover: SEM image of internal structure of over 100 granules.

We have serendipitously found that we can make ‘seeded granules’ by Cyclomix under certain operating conditions and feed powder particle size distribution. The Scanning Electron Micrograph on the front cover shows a number of seeded granules, embedded in a resin on a plane and cut and polished to show the internal structure. Every granule has consistently a seed, which is a large particle from the top end of the size distribution of the feed powder.

Cyclomix is manufactured by Hosokawa Micron (B.V.), the Netherlands, and falls in the category of high shear mixers and granulators. It is a very fast mixer, as shown by our mixing studies¹⁾, using the Positron Emission Particle Tracking facilities of the University of Birmingham. It has also been developed into a high shear granulator²⁾, the context in which we have been using it. In a research programme supported by the Granulation Consortium, consisting of Borax Europe, Hosokawa Micron (B.V.), Pfizer, Procter and Gamble and the Engineering and Physical Research Council of UK, we have been investigating the effect of scaling up of granulators on the internal structure and physical and mechanical properties of the granules^{3,4)}. Different commercial grades of calcium carbonate were used as model materials and aqueous polyethylene glycol (PEG) as the binder. Using the X-ray micro-tomography facility of our Institute, we observed that under certain conditions we got a feature at the core of the granules, as shown in the figure below⁵⁾. Detailed examinations revealed this to be a large particle from the feed powder, due to the fact that we had been using a wide size distribution. We could also produce the same structure by adding some coarse powder to the feed. The particular noteworthy feature is that each coarse particle can produce a granule, but only under certain conditions. A regime map has been identified for production of consistent seeded granule structure⁵⁾, based on the size distribution of the feed powder and the concept of critical Stokes numbers for coalescence, deformation and breakage of wet granules⁶⁾.

References

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