

The importance of fine grinding for analysis within the life science industry

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The demand for a higher level of fineness is increasing within the food and life science industries as analysis is performed with great accuracy on reduced sample amounts. A higher fineness is interesting in many aspects: Since many materials change their characteristics and their effects on the organism depending on the particle size, this is interesting for example in the area of exploration of new active components of pharmaceutical products.

A centrifugal mill is the ideal tool to achieve fineness in a short amount of time (Figure 1). The new instruments make this possible as the rotor peripheral speed has been increased by more than 20% up to 110m/s, in comparison to instruments to date.

For analytical tasks the requirements in regards to homogeneity also increase, since modern analytical instruments need less and less sample material. With a constant initial volume, the analysed sample amount has to remain representative for the entire sample. This is only possible if the original sample is comminuted further.



Figure 1. The Fritsch Variable Speed Rotor Mill PULVERISETTE 14 premium line

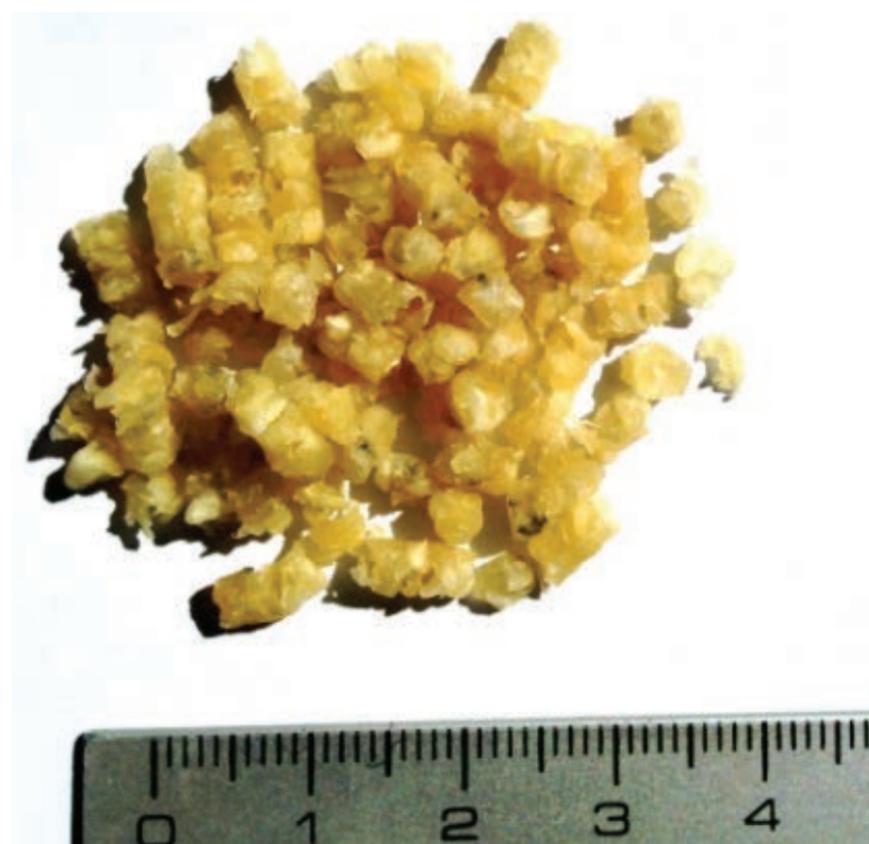


Figure 2. Basic material: dried, pre-crushed mushrooms

Of great interest is also the particle size during extraction as a method of analysis (for example determining the fat content) or as a step in extracting special ingredients for the R&D sector. The specific surface is decisive for the quality and reproducibility of the result. The smaller the particles become, the larger their specific surface gets and much more exact and reproducibly accurate will be the result.

An example from the industry of food and life science impressively shows the difference between established instruments to date newer instruments now available. The instruments used for this experiment were the PULVERISETTE 14 classic line and the PULVERISETTE 14 premium line. With the newer instrument dry mushrooms were comminuted (Figure 2) double as fine as it was possible with to date available Centrifugal Mills (Figure 3). The cell walls of mushrooms contain among other things the so called β -1,3-glucan, which in vitro and in animals based on in-vivo examinations stimulates the immune system and supports et al. the healing of wounds [1,2]. Due to better fine grinding the active component can be extracted more effectively. The familiar cytotoxic effect of β -glucan in the course of cancer treatment is based rather on the impurities of the active component, because if instead of the concentrated, pure β -glucan was used, no cytotoxic effect was detected [3].

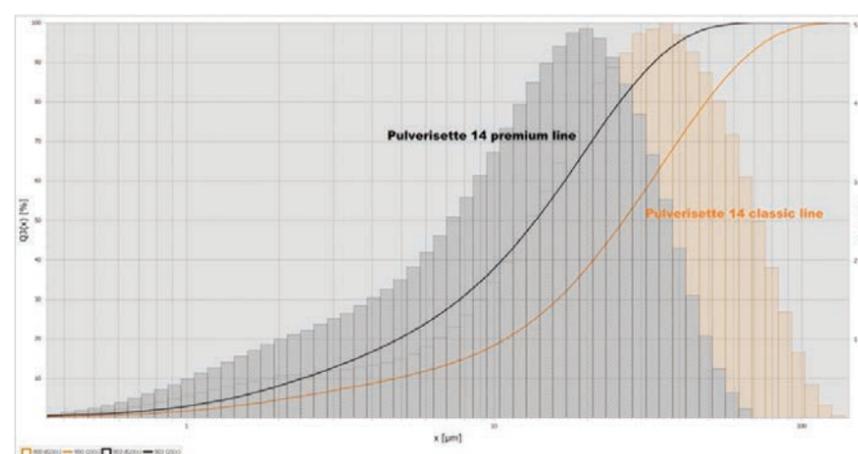


Figure 3. Particle size distribution after comminution with the Fritsch Variable Speed Rotor Mill PULVERISETTE 14 classic line (orange) and premium line (black). The sample comminuted with the P-14 premium line is twice as fine as the sample ground with the P-14 classic line. For the particle size analysis the Laser Particle Sizer Fritsch ANALYSETTE 22 NanoTec is utilised.

Figure 3 shows in comparison the particle size distribution after the comminution of the sample with the PULVERISETTE 14 classic line (20.000 rpm, 0.08 mm sieve ring with trapezoidal perforation, rotor with 24-ribs) and the PULVERISETTE 14 premium line (22.000 rpm, 0.08 mm sieve with ring trapezoidal perforation rotor with 24 ribs). In comparison, to the comminution with the PULVERISETTE 14 classic line the material is double as fine. The d50-value was halved from 26 μ m down to 13 μ m. The d90-value was also halved (63 μ m to 33 μ m).

For the comminution of larger amounts into the kilo scale, the PULVERISETTE 14 premium line can be connected with the Fritsch Vibratory Feeder LABORETTE 24 and with the Cylone Separator (Figure 4).



Figure 4. PULVERISETTE 14 premium line with stainless steel Cyclone Separator converted for the comminution of larger amounts

After comminution, the sample is therefore directly and precisely transferred into the collecting vessel. Due to the increased airflow the sample and grinding parts are additionally cooled and the temperature of the system remains constantly below 65°C [6] – the critical temperature for β -glucan.

In terms of safety, all system- relevant parts such as the rotor, collection vessel and lid are automatically checked to see if they are complete and if their position is correct before the instrument starts. A faulty operation is therefore impossible. New and unique for this Centrifugal Mill is also the incorporated temperature measurement of the system. This is vital during the comminution of heat-sensitive and unstable materials such as plastics, resins, plants, spices to ensure the milling process can be stopped in time. By changing the accessories, the PULVERISETTE 14 premium line becomes quickly and easily a Cutting Mill. For its variability paired with absolute operator safety, the PULVERISETTE 14 premium line has received an award twice [4,5].

Please view the video for this instrument at:
www.youtube.com/embed/Rn3nWGQD9mM?rel=0

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6. Customer information.



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