

TECHNOLOGICAL CHALLENGES IN THE PROCESSING OF FUNCTIONAL FOODS USING FLUIDIZED BED PROCESSES

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Introduction

The production of foods in which bioactive ingredients are naturally contained, enriched or added so that a physiological function can be achieved poses challenges for food technology. For example, there is a need to stabilize the often sensitive substances or improve their solubility in order to ensure their bioavailability over the entire shelf life. Taste or odour masking as well as time or pH-dependent release control may also be necessary in order to maximize the effect of the bioactive ingredients. For the technological challenges described, encapsulation of the bioactive ingredients based on fluidized bed processes can solve the problems.

The aim of this case study is to compare different process options for achieving time-dependent release control.

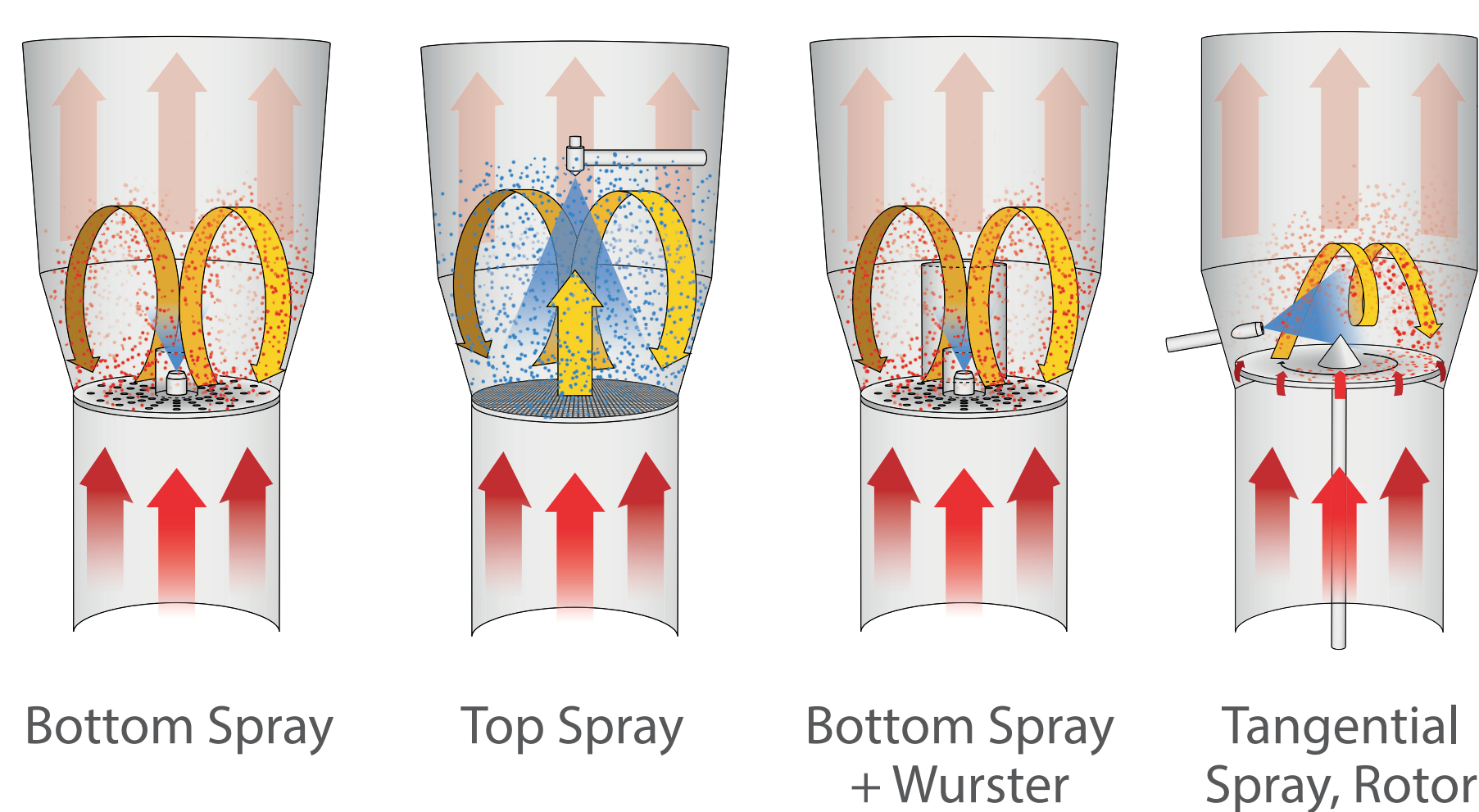


Fig 2. ProCell® LabSystem with different process options.

Methods

Model particles were produced as a representative basis. For this purpose, a spherical pellet was first coated with a model drug NaCl (Figure 1).

A functional layer based on hydroxypropyl methylcellulose (E464) and neutral methacrylate copolymers (E1206) was then applied to the model particles using four different fluidized bed processes (Wurster technique, top spray, bottom spray and rotor processing; Figure 2).

In addition to the influence of different processes, the influence of the spray pressure (2.0 and 2.5 bar) on the release profile was also investigated. To characterize the particles produced (Figure 3), the particle size distribution (Cilas 1190 LD laser granulometer), the hardness of the particles (Texture Analyzer Stable Micro Systems) and the release profile of NaCl (WTW laboratory conductometer inoLab Cond 730) were measured.

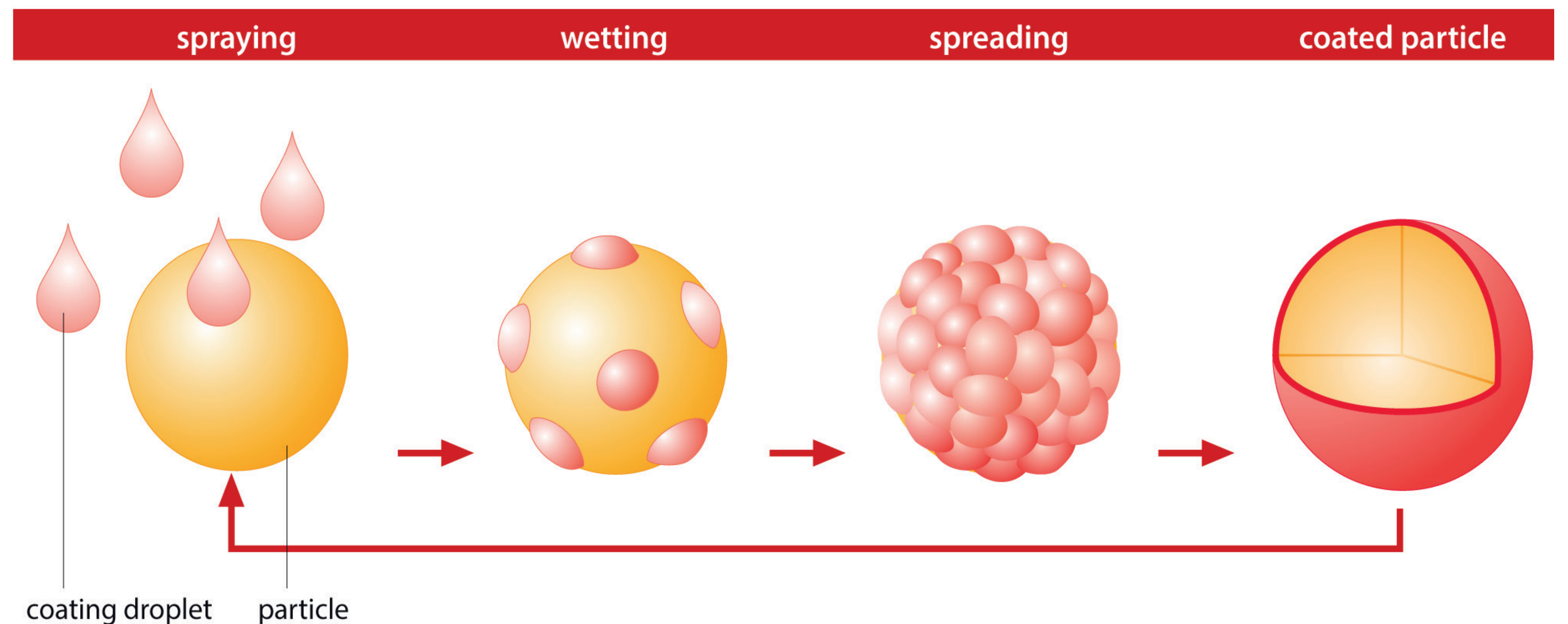
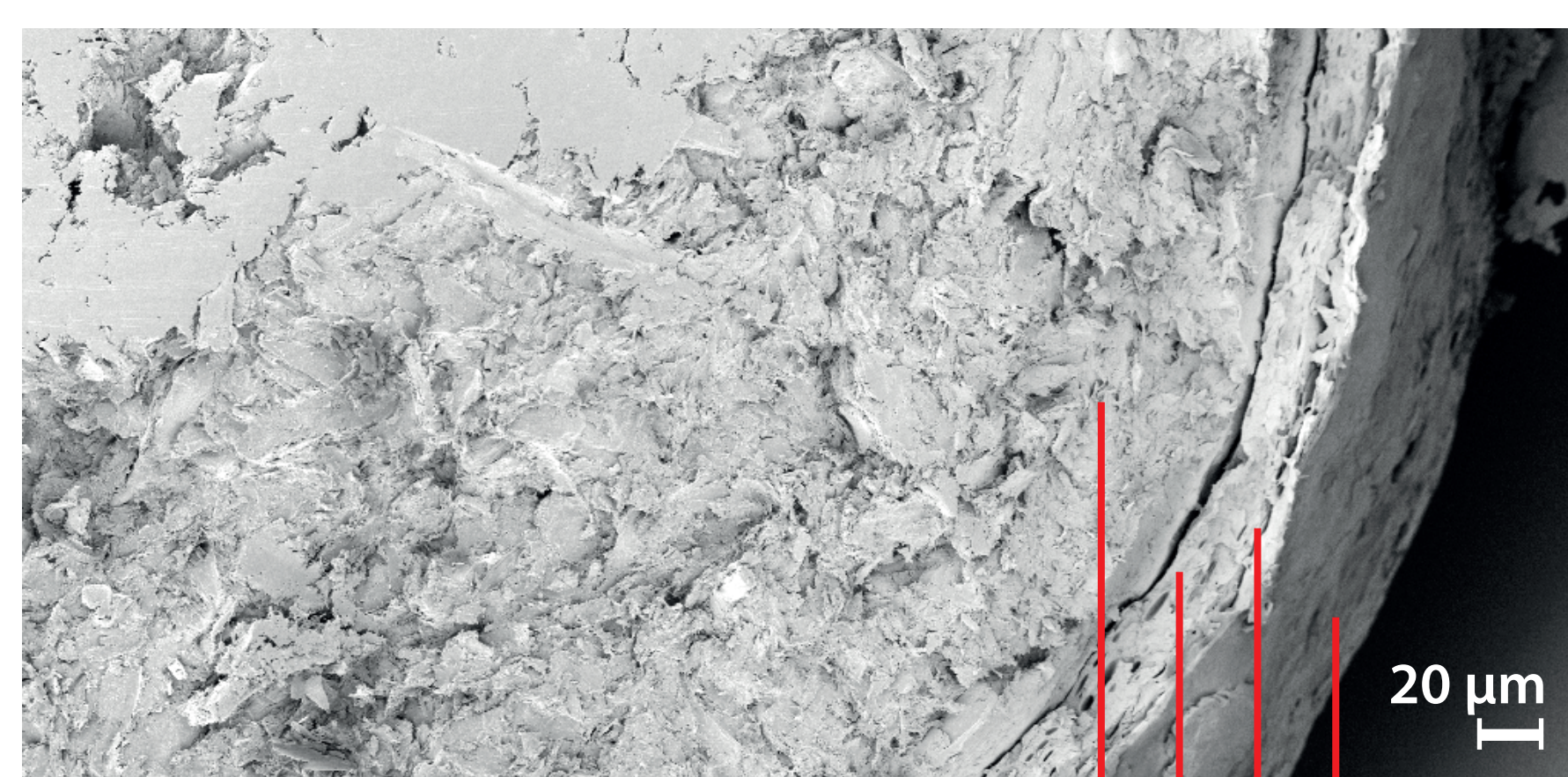


Fig. 1 Application of ultra-thin layers in film coating: The coating material is applied by spraying the solids-containing liquid onto the fluidized particles, and the film is dried and solidified in a single process step. The coating liquid is sprayed onto pre-coated solids. The supplied process air evaporates the liquid and dries the film layer. Small droplets and low viscosity ensure uniform distribution and thus a high-quality film.

Results

The results showed that the spray pressure has no significant influence on the particle size distribution, but does have an effect on the hardness of the particles and the release profile (Figure 4). However, the influence is strongly dependent on the selected process option. For example, the spray pressure using the rotor has no relevant influence on the particle hardness and the release profile. In contrast, the release of NaCl using the bottom spray option can be accelerated from 40 to 60 % after 30 minutes by using a higher spray pressure.

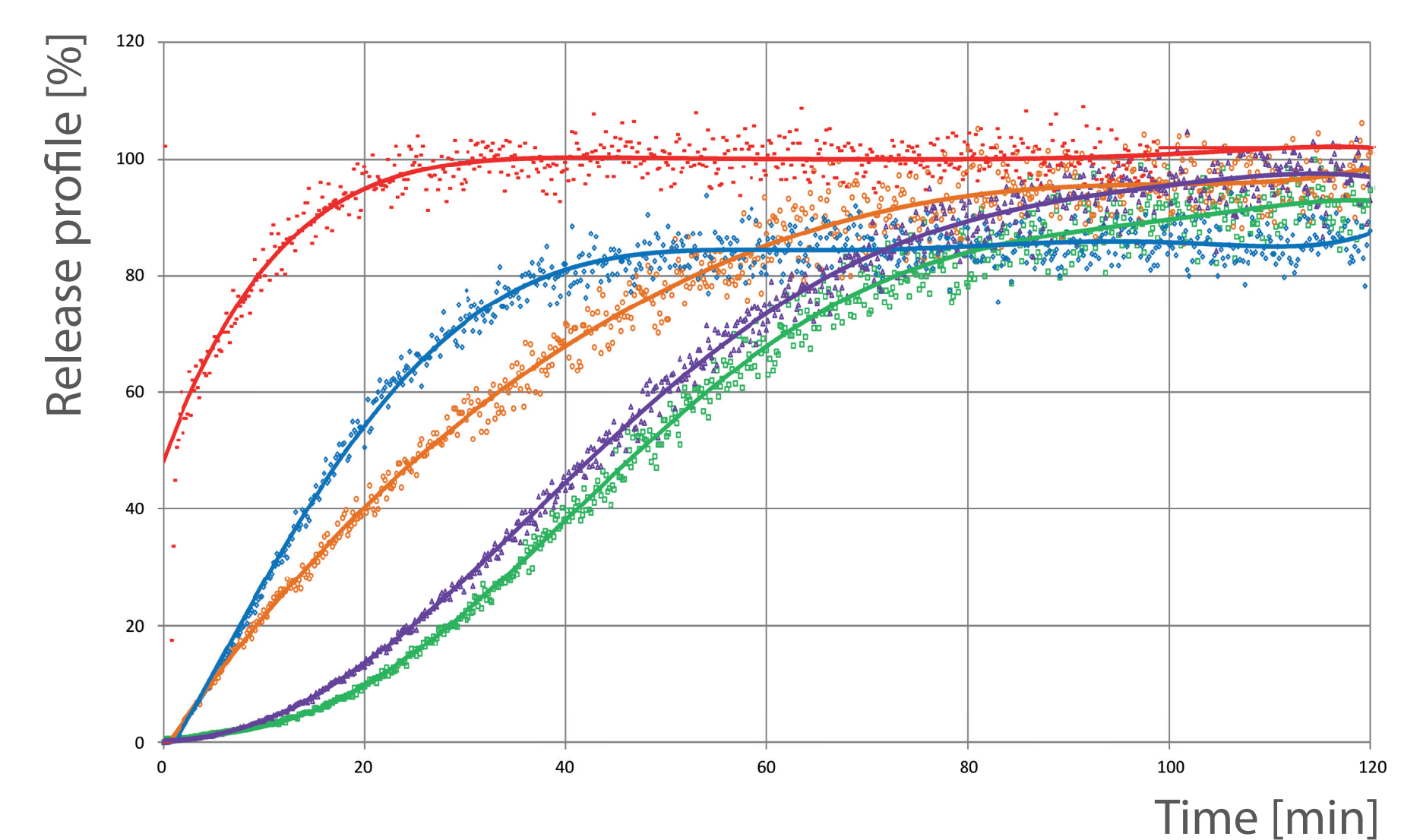
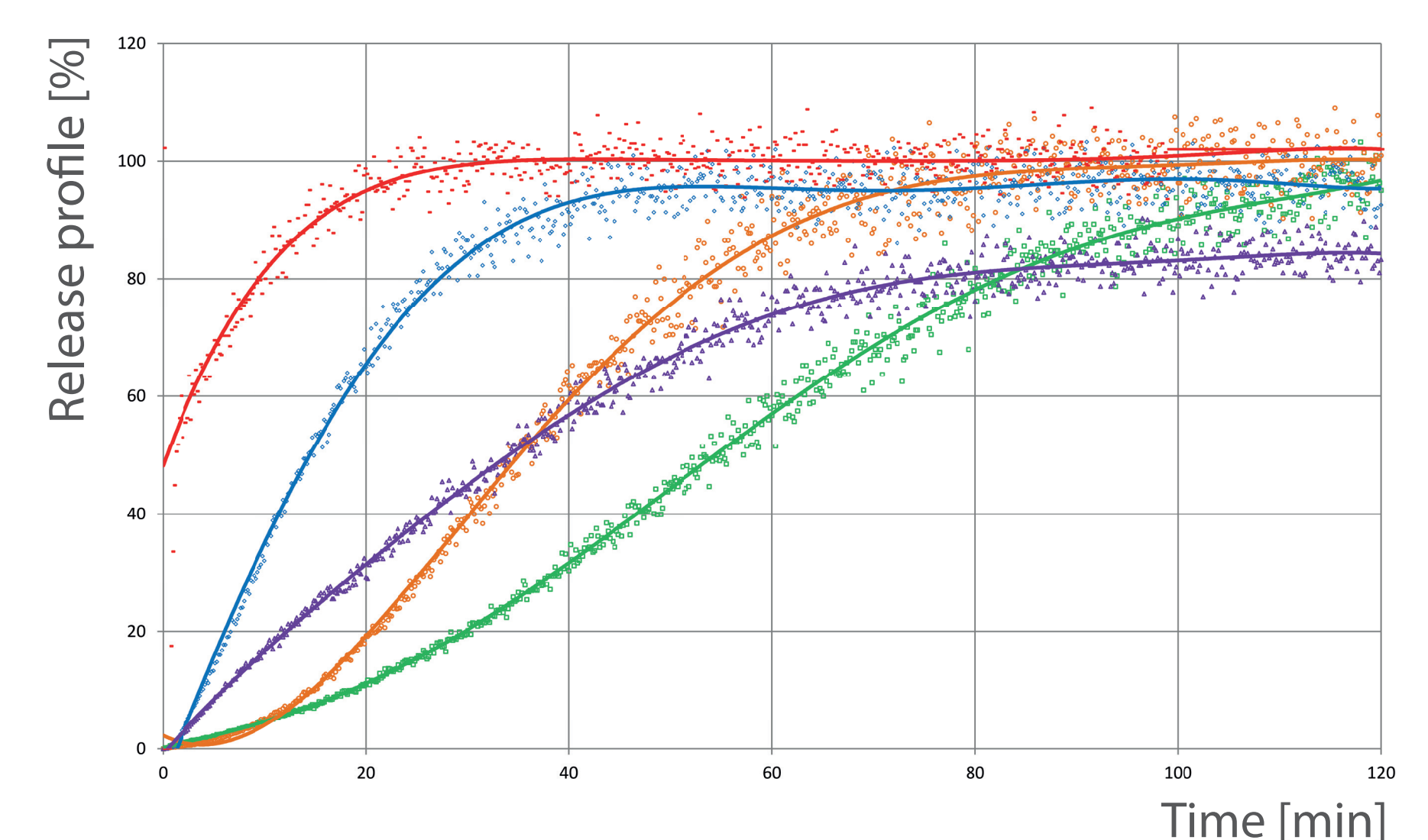


Cellet 1000
Model substance (NaCl)
Hydroxypropylmethylcellulose (E464)
Methacrylat-Copolymer (E1206)

Figure 5: SEM-Picture modell particle of Wurster-Process

Conclusion

In particular, knowledge of the relationships between particle hardness, release profile and process conditions is of decisive importance for the application of fluidized bed processes for processing functional foods in order to select the optimum system configuration for solving technological challenges.



Model Substance Rotor Bottom Spray Top Spray Wurster

Figure 4: Release profile depending on process option, 2.0 bar spray pressure (upper diagram). Release profile depending on process option, 2.5 bar spray pressure (lower diagram).



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for more information on technological challenges in the processing of functional foods using fluidised bed processes