



METHOD TO ESTIMATE RECONSTITUTION OF FOOD POWDER IN LIQUID

Context

The dissolution ability of a dry powder in a liquid depends on many parameters, including wettability, sinkability, dissolution, or dispersibility. These parameters affect the customer perception of the overall product quality.

A large range of food powders exists, such as nutritional powder, dehydrated milk, baby milk, chocolate milk, beverages...

In this application note, we propose a methodology to assess the dry powder quality for reconstitution in liquid.

Method

The efficiency of 3 different food powders is assessed with a quick and simple protocol: a glass cell is filled with 15 mL of distilled water and 2g of powder is deposited on the water. No stirring is applied to the product.

Food powder 1	Horlicks (GSK)
Food powder 2	Milo (Nestlé)
Food powder 3	Bourn Vita (Cadbury)

TURBISCAN measurement starts just after the powder layer is deposited. The measurement is performed at 25°C. The following graph displays a typical TURBISCAN profile obtained.

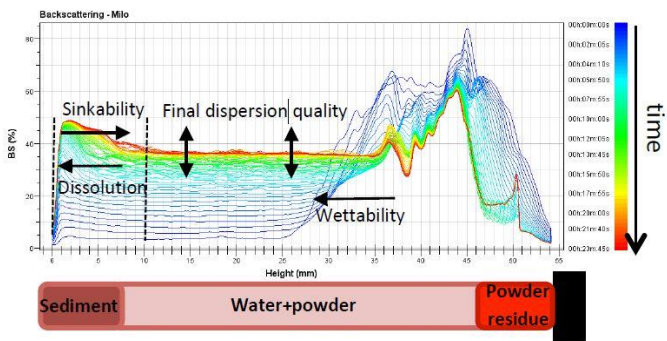


Fig.1: Evolution of the transmission signal for food powder 2 and schematic of the glass cell after 30 minutes

This graph shows information regarding the **wettability** of the powder, the **sinkability**, the **dissolution power**, and the final **dispersion quality**.

Results

Wettability

The wettability influences the speed of penetration of the powder layer in the water volume. The wettability level is directly linked to the backscattering peak thickness speed formation under the powder.

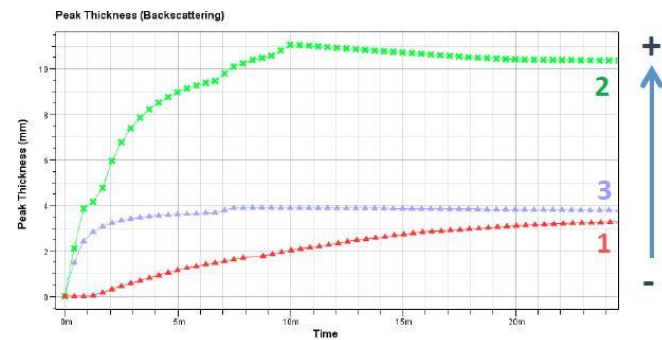
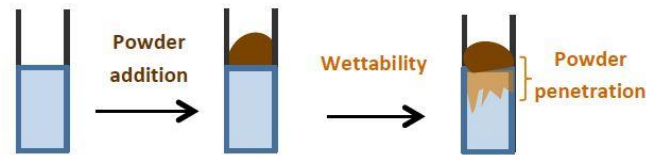


Fig. 2: Peak thickness for powders 1,2, and 3

Sample	Slope of peak thickness (mm/h)	Wettability
Food powder 1	16	-
Food powder 3	88	+
Food powder 2	99	+

These results show that the speed of peak formation (directly linked to wettability) increases from sample 1 to 3 and is the best for sample 2.

Sinkability

The sinkability corresponds to the ability to overcome the surface tension of water and sink into water after passing through the surface and so forming a sediment layer. Sinkability is directly linked to the peak formation speed at the bottom of the cell.

The following graph displays the backscattering peak thickness obtained at the bottom of cell, corresponding to the sediment layer formation.

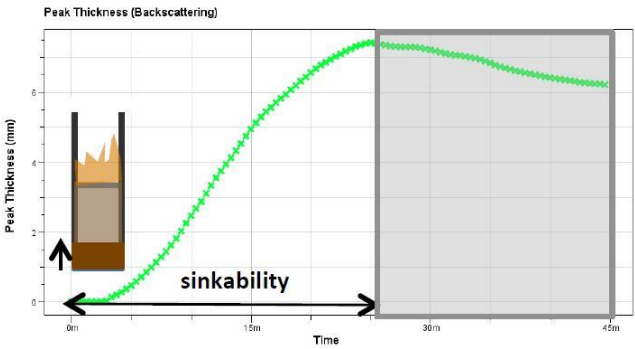


Fig.3: Peak thickness at the bottom of the cell for sample 2

The slope of the bottom peak thickness gives the speed of peak formation, directly linked to the sinkability of the powder.

Sample	Slope of peak thickness in the increase of the curve (mm/h)	Sinkability
Food powder 3	8	-
Food powder 1	12	+
Food powder 2	12	+

This table shows that powder 2 gives the greatest speed, meaning the best sinkability.

Dissolution power

The dissolution follows the sinkability; it corresponds to the sediment layer decrease. Indeed, when the sediment dissolves in water, its thickness decreases.

Figure 3b gives additional information about the dissolution of the powder. This parameter can be assessed by calculating the slope of the peak thickness in the decreasing zone of the curve. The higher is the slope, the best is the dissolution power.

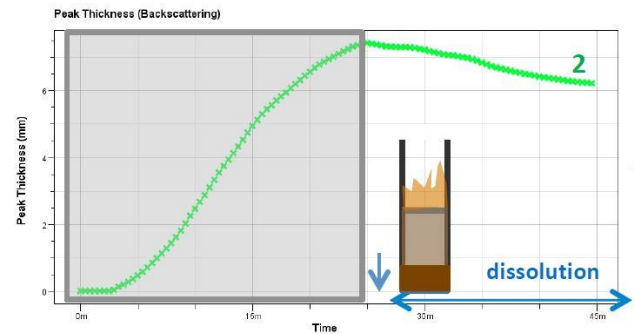


Fig.3b: Peak thickness at the bottom of the cell for sample 2

Sample	Slope of peak thickness in the decrease of the curve (mm/h)	Dissolution
Food powder 1	0	-
Food powder 3	-0.23	↓
Food powder 2	-4.2	+

This table shows that powder 2 has the greatest slope (in absolute), meaning the best dissolution powder. Other powders lead to similar slope values close to 0, meaning no dissolution.

Final dispersion quality

The quality required for these powders is a quick and easy dispersion. The final dispersion quality is compared to a suspension prepared at 60°C under stirring. The TURBISCAN signal in backscattering in the middle of the sample is directly linked to the dispersion state:

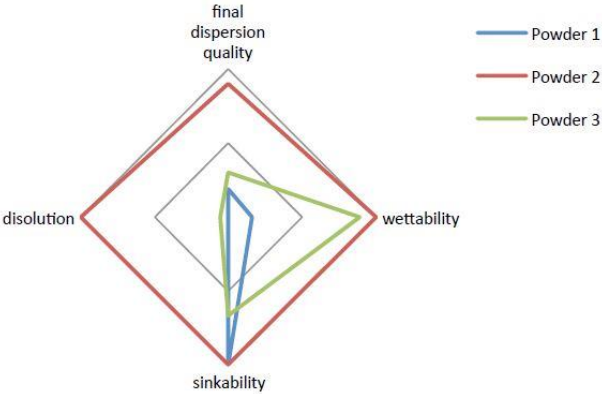
Sample	Turbiscan signal* after 20 min at 25°C (%)	Turbiscan signal* for complete dispersion at 60°C (%)	Dispersibility ratio (%)	Final Dispersion quality
Food powder 1	4	21	19	-
Food powder 3	3	10	30	↓
Food powder 2	36	40	90	+

*backscattering level in the middle of sample

This table shows that dispersion efficiency increases from sample 1 to 3 and is much better for sample 2.

Summary

This Application Note shows a quick and simple methodology to qualify the reconstitution of food powders in only one single experiment. The following graph summarizes the results obtained.



Food powder 2 displays the best performance for the four criteria of powder efficiency: wettability, sinkability, dissolution and final dispersion state at rest.



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