

Food

Particle size analysis of foodstuffs with the CAMSIZER XT®

Application

The CAMSIZER XT can analyze the foodstuffs which typically come in many different forms of appearance such as powders, crystals, granulates or suspensions. Particle size of both raw materials and finished products affect taste, solubility, extraction behavior, mouth feel and many other physical

properties. The material is often agglomerated, oily or sticky, so proper dispersion is a big challenge. Air jet sieving or laser diffraction are commonly used methods, but they suffer from bad resolution and high labour input (sieving) or limited data significance or sensitivity (laser diffraction).

Typical sample material

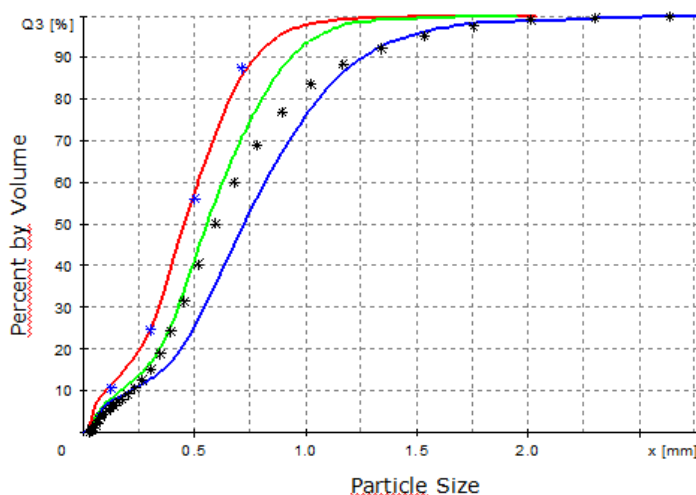
The following materials can conveniently be analyzed with the CAMSIZER XT:

- Ground coffee
- Salt
- Spices
- Nutraceuticals
- Flavours
- Food additives (vitamins, citric acid, sorbates, sulphites, sweeteners etc...)
- Baby Food
- Animal Food
- Flour
- Formula (Baby Food), Milk Powder

Example: ground coffee

The CAMSIZER XT® is perfectly suitable for the size analysis of ground coffee. Different types of coffee require different fineness: espresso powder for example is much finer ($d_{50} \sim 250 \mu\text{m}$) than coffee powder used to prepare filtered coffee ($d_{50} \sim 500 \mu\text{m}$). Because the CAMSIZER XT can detect the real image of individual particles, the result can be calculated based on particle width, length or equal area diameter. Note how different the results of laser diffraction and sieving are

in Figure 1. Depending on which size definition is used with the CAMSIZER XT, the results of other techniques can be matched. Note that the $x_{c \text{ min}}$ (particle width) is almost identical to sieving, laser diffraction tends to give wider distribution than image analysis, because this method is always using a sphere model whereas the CAMSIZER XT measures the direct length and width of every particle.



*Fig. 1
A sample of ground coffee, measured with the CAMSIZER XT. The red curve represents the $x_{c \text{ min}}$ (particle width), the green curve is the x_{area} (equivalent area diameter) and the blue curve is the $x_{\text{Fe max}}$ (particle length). Black asterisks represent laser diffraction result, blue asterisks are the sieve analysis.*

Example: Formula

The second example illustrates the ability of the CAMSIZER XT to disperse and measure highly agglomerated powders like formula (baby food). The material contains particles down to 10µm. Fig. 2 shows measurements of the formula powder at different dispersion pressure (red: 30kPa, green: 150kPa, blue: 300kPa). Note that the result gets finer with increasing pressure, which means that the particles are better dispersed (upper graph). Dispersion can be

monitored by saving and evaluating individual images (Fig. 2, right side). The lower graph shows the particle roundness as Q₃ distribution. The particles are less round when measured at low dispersion pressure, agglomerates are typically have a very irregular shape. However, it is not always advisable to use the highest possible dispersion pressure, because sample consumption is higher and particle breakage might occur.

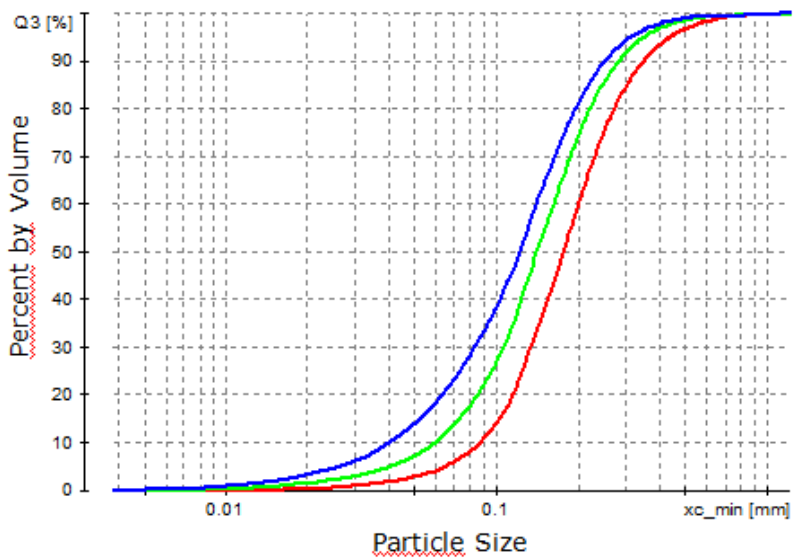
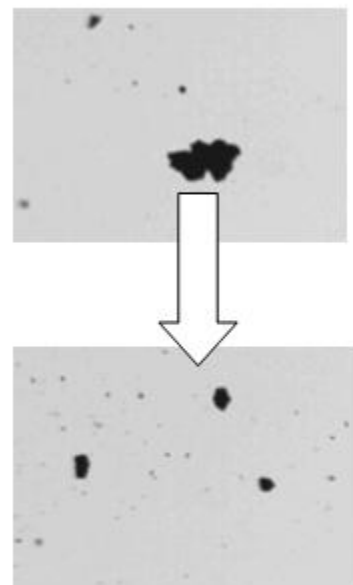
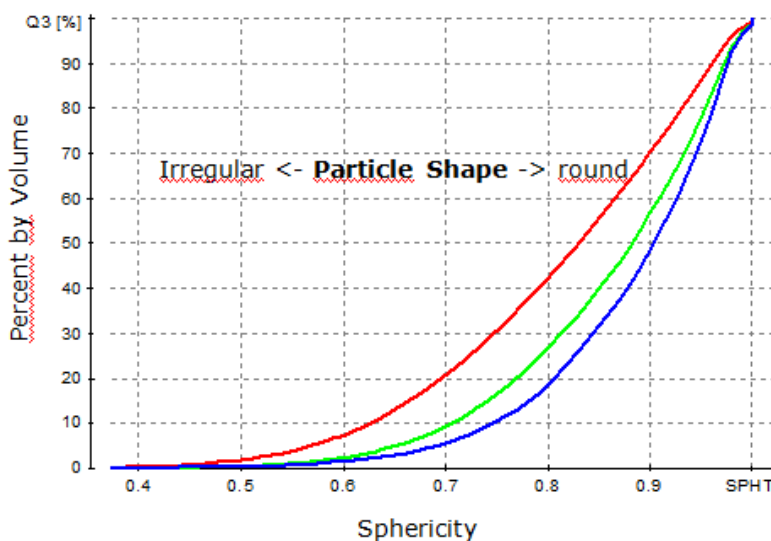


Fig. 2: Formula powder measured with the CAMSIZER XT at different dispersion pressure. The result gets finer with increasing pressure.

Low pressure: Agglomerates



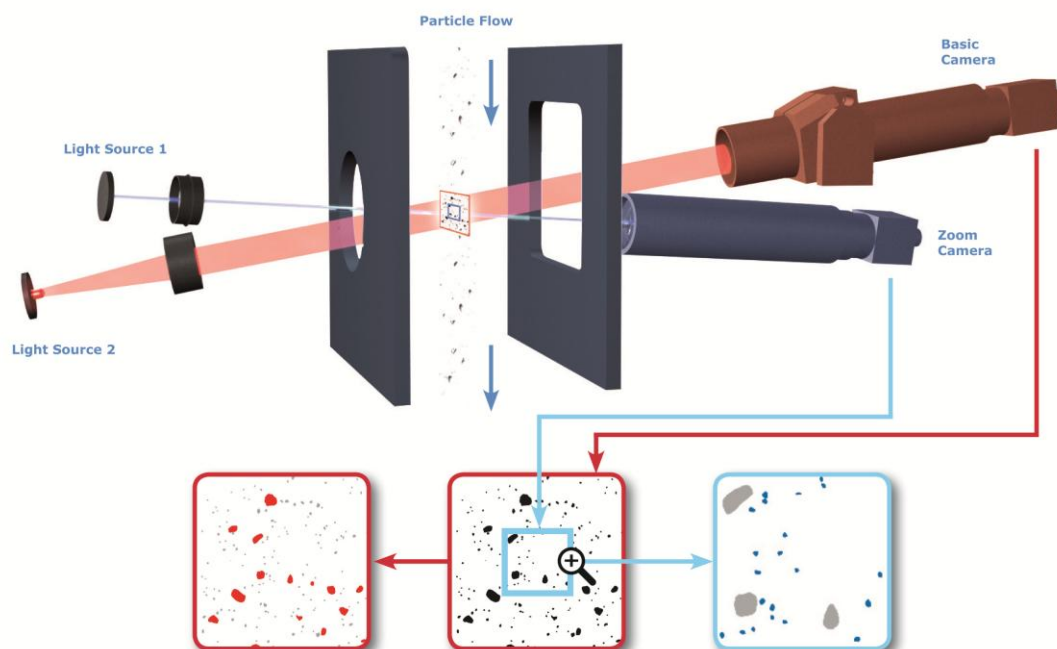
High pressure: perfect dispersion



CAMSIZER XT[®] - Benefits at a glance

- Faster results
- Less manpower required
- Wet measurements using water, alcohol, org. solvent, brine, vegetable oil
- Dry measurement with air-jet dispersion 20-460kPa, free-fall option
- Higher resolution than sieving or laser diffraction
- High sample throughput
- Excellent reproducibility
- Larger sample quantities provide better statistics
- More objective, independent of operator
- No abrasion, non-destructive measurement
- Higher sensitivity for oversize particles than laser diffraction
- Shape analysis: length and diameter of particles
- Easy to use
- Different software levels enable operation by unskilled personnel
- Low maintenance, robust design
- Measurement time typically 2-5 minutes



CAMSIZER XT - Measurement Principle**Patented measurement principle**

With Dynamic Image Processing, the particles move with the help of gravity, compressed air or dispersed in liquid through the measuring field. A light source illuminates them from one side while a camera takes their picture from the other side. The software evaluates the projections of the particles to determine the size distribution of all particles of the sample in a very short time. A few hundred particles per picture are evaluated in real time, more than 275 pictures per second.

The maximum dynamic measuring range, i.e. the difference between the smallest and largest detectable particle, is substantially extended by using two aligned cameras.

A high resolution camera detects small particles in a small measuring field. A camera with lower resolution but a wider measuring field simultaneously detects the larger particles, allowing for rapid measurement with good statistics.