Next-generation powder analyzers

Mass-centric particle characterization

The femtoG PowMaster precisely characterizes pigments and fillers by measuring **particle mass (in femtoGrams) and diameter**. It eliminates assumptions about **shape, aggregation, and optical properties**. Structure is resolved by measuring effective density, delivering rapid, **application-specific insights** for QA/QC and R&D.

Find out more about PowMaster!

Scan range
0.0002 – 200.000 fg (~25 – 5.000 nm)

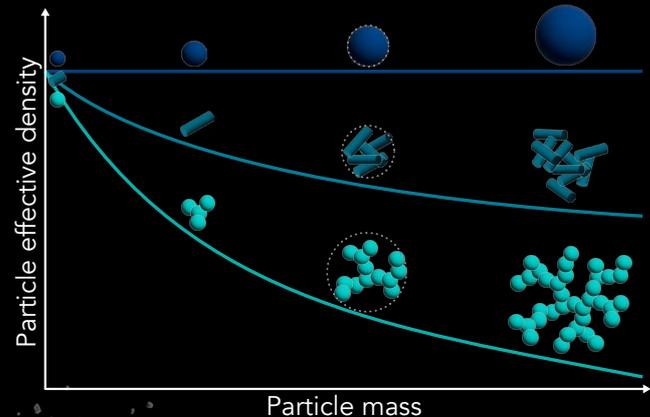*Extended scan range available soon*

Scan time
5 – 15 minutes (counting millions of particles)

Sample preparation
Dry and wet dispersion, or direct sampling from reactor

Deagglomeration
Variable, allowing probing different structural levels

Particle effective density

Particle mass

Structural insights at a glance

*The femtoG fingerprint for quick particle structure comparison*

The femtoG fingerprint maps particle density versus mass and diameter, providing a **unique structural signature** for different materials. It enables **rapid comparison** of pigments, revealing differences in aggregation, porosity, and packing density. Unlike conventional methods, it captures structural variations at **multiple scales**, offering deeper insights into material properties.

Key benefits:

✓ Rapid structural comparison of materials

✓ Differentiates aggregated vs. isolated particles
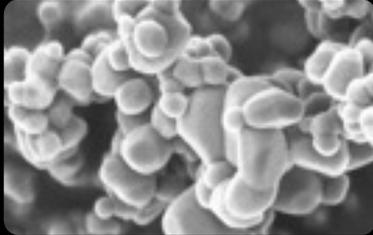
✓ Captures porosity and packing density variations
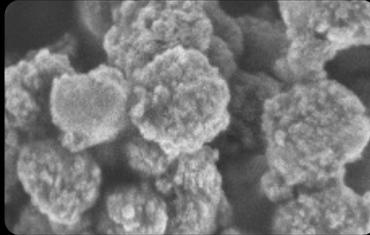
Get full study here!
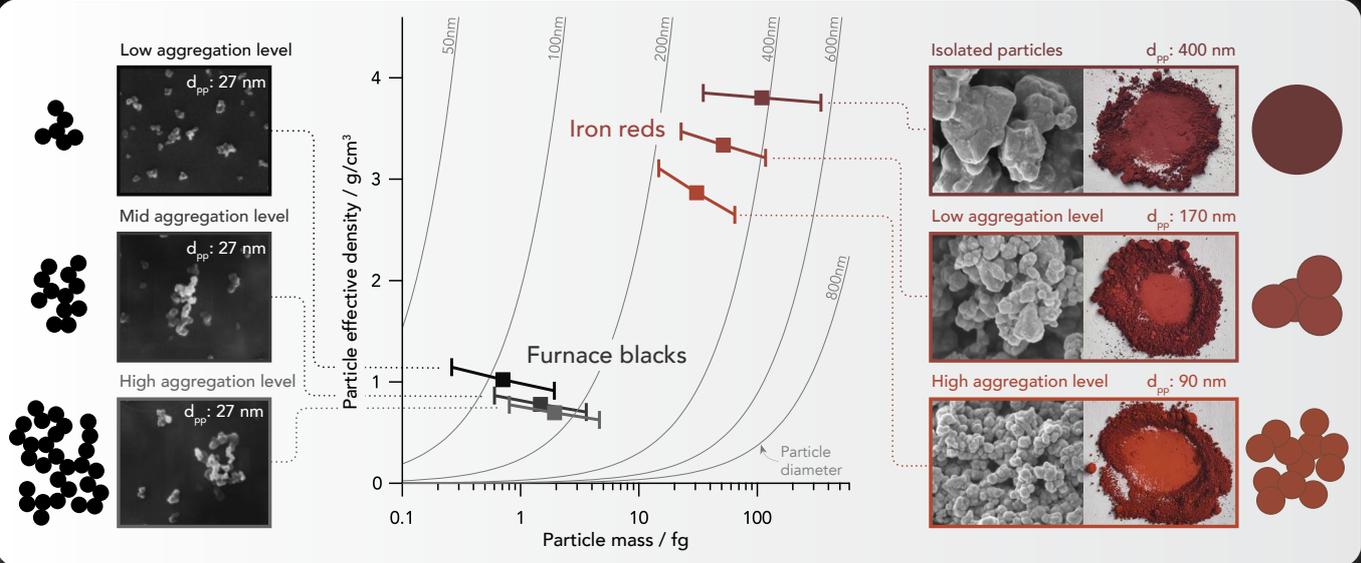
Understand process impacts

Destruction of core-shell particles (surface-treated titanium dioxide)

Excessive mechanical stress can cause the **destruction of encapsulated pigment**, affecting particle performance. Use PowMaster to follow the delamination of your particles **during dispersion** quantifying coating loss and nanoparticle release.

Uncoated TiO$_2$

TiO$_2$ with silica coating

Get full application note here:

Surface-treated TiO$_2$
ultrasound energy input
- 800 J/ml
- 400 J/ml
- 200 J/ml
- 100 J/ml
- 50 J/ml
- 0 J/ml
- ○ eff. particle packing density

$m = 2.35 g/cm^3 \cdot \pi/6 \cdot 10 \cdot dia^3$

$m = 3.77 \cdot 10^{-6} \cdot dia^{2.55}$

Sheared-off silica

TiO$_2$ cores

Number of particles per gram $dN_{Par}/dlog(M_{part})$

Effective density / g/cm³

Number of particles per gram cumulative distribution

Particle mass / fg

Diameter - silica / nm

Diameter - TiO$_2$ / nm

mechanical stress

Key benefits:

✓ Quantify coating delamination at variable dispersion energies

✓ Nanoparticle release under different treatments

✓ Insights for process optimization
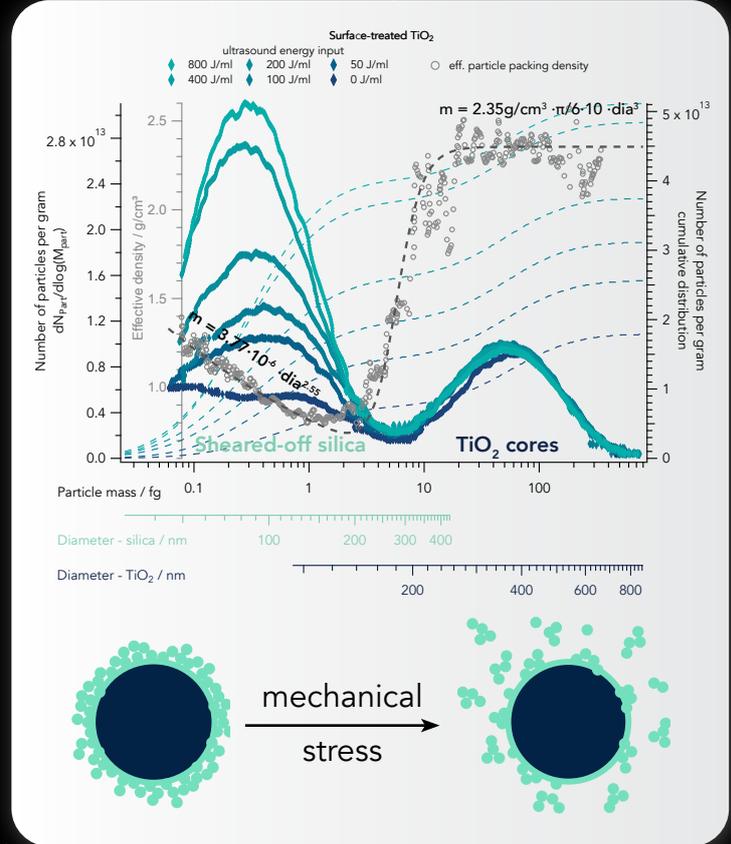
Master analytical obstacles

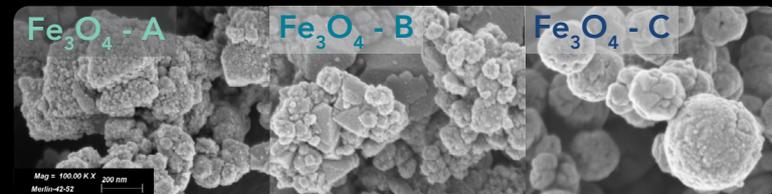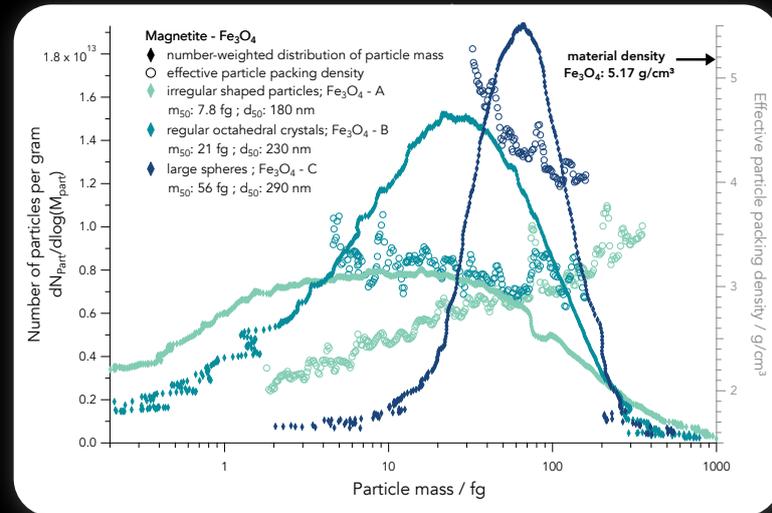*Characterizing magnetic particles (Fe$_3$O$_4$ – C.I. pigment black 11)*

Determining the **size of magnetite particles** (pigment black 11, Fe$_3$O$_4$) with traditional light scattering techniques or sedimentation analysis is challenging. Dispersed particles tend to **reagglomerate quickly** due to their magnetic properties. The particle shape and density varies greatly from **irregular-shaped and porous structures** (**A**) over regular octahedral crystals (**B**) to large spherical particles (**C**).

PowMaster avoids these limitations:

➤ Aerozolising particles in air prevents reagglomeration due to the considerable distances (~100 μm) between particles.

➤ The particle packing density is measured and provides valuable information to describe the particle structure. For example, in sample **B** small particles are more porous than large particles – an unusual feature.

Key benefits:

✓ Aerolization prevents reagglomeration

✓ Particle mass offers reliable data even for challenging, irregular particles

Magnetite - Fe$_3$O$_4$

◆ number-weighted distribution of particle mass
○ effective particle packing density
● irregular shaped particles; Fe$_3$O$_4$ - A
  m$_{50}$: 7.8 fg ; d$_{50}$: 180 nm
● regular octahedral crystals; Fe$_3$O$_4$ - B
  m$_{50}$: 21 fg ; d$_{50}$: 230 nm
◆ large spheres ; Fe$_3$O$_4$ - C
  m$_{50}$: 56 fg ; d$_{50}$: 290 nm

material density
Fe$_3$O$_4$: 5.17 g/cm³

Number of particles per gram dN$_{Part}$/dlog(M$_{Part}$)

Effective particle packing density / g/cm³

Particle mass / fg

Fe$_3$O$_4$ - A   Fe$_3$O$_4$ - B   Fe$_3$O$_4$ - C

Mag = 100.00 K X   200 nm
Merlin-42-52

Get full study and read further here:

Innovative powder solutions for you!

Next-generation analyzers
... harness innovation from the start

Specialty powder analyses
... get a boost of extra understanding

Research projects
... personalized to your needs all at once

Consulting
... let our experts support your team

info@femtoG.com
www.femtoG.com

Measured in Switzerland   by femtoG experts

Spin-off | **ETH** *zürich*

femtoG is a young start up pioneering particle mass in powder characterization. Based in Zurich (Switzerland), we offer next-generation analyzers and lab analyses to overcome analytical challenges related to complex particle structures. We are proud to be recognized as a spin-off from ETH Zürich.

Contact us today - we look forward to hearing from you!

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Scan to learn more!

Application Notes

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