BRAVE
ANALYTICS

analytik

BRAVE SOLUTIONS FOR PARTICLE ANALYTICS

(Nano)particle sizing and characterization devices with optional in-flow Raman analysis

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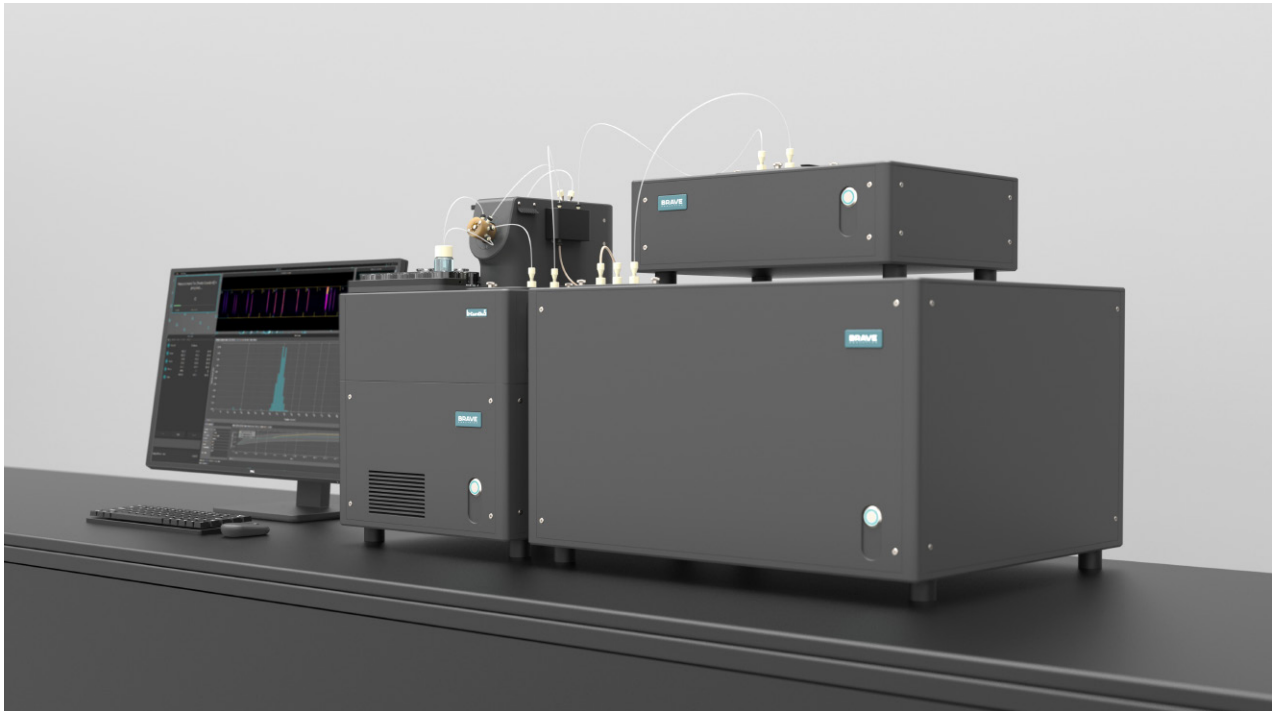
A BRAVE NEW APPROACH TO PARTICLE ANALYSIS

BRAVE Analytics develops and delivers lab and PAT solutions for particle analytics. We bring you unmatched solutions for water and environmental analysis, for biotech applications and the pharmaceutical industry:

- Lab device for continuous detection and Raman analysis of particles in-flow >> BRAVE B-Elementary
- PAT sensor for 24/7 monitoring of particle size distributions and particle concentrations >> BRAVE B-Continuous
- Lab device for continuous time-resolved particle sizing, even for polydisperse systems, ultra-low concentrations and during reactions >> BRAVE B-Curious



Benefits of BRAVE devices:

- **Minimum sample preparation**

Size, concentration and PSD measurements require only dilution; analyzing particles e.g. microplastics in water needs no sample preparation at all.

- **Single-particle sensitivity**

Detect single particles and see results based on every particle's individual properties.

- **Continuous measurement**

Get a chemical analysis, measure the size of your particles during flow and monitor sample behavior as it happens.

- **For challenging samples**

Analyze polydisperse systems, ultra-low concentrations, aggregates, anomalies and large-particle tails.

BRAVE MEASURING METHODS

The patented OF2i® method is a unique way of measuring the size and concentration of particles continuously. It can also be combined with Raman spectroscopy to deliver in-flow Raman analysis of single particles.

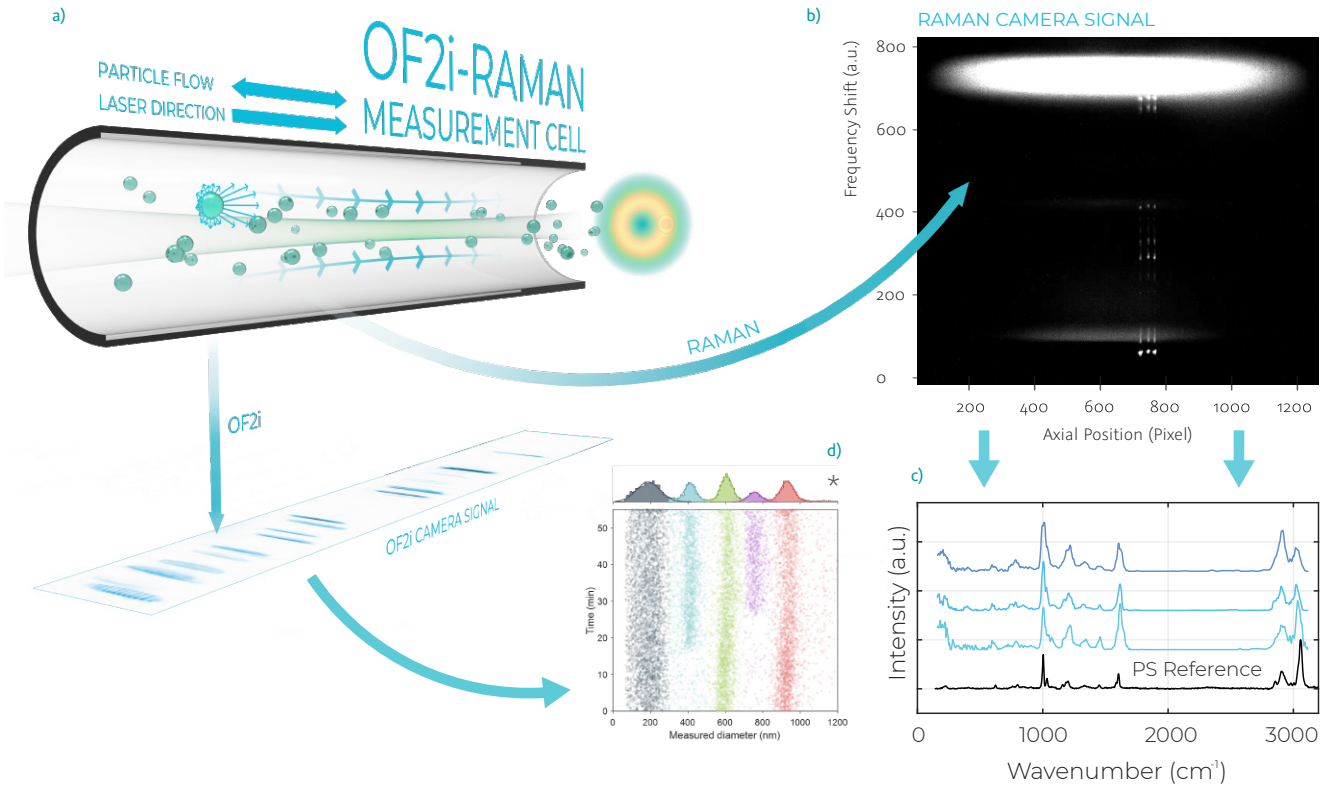


Figure 1: *The schematic shows the OF2i®-Raman setup in the measurement of 5 µm polystyrene (PS) beads. (a) Fluidic forces transport the particles through the cell; a focused laser beam optically manipulates the particles. See Reference 2. (b) A SCMOS camera records the scattered Raman signal of individual particles at up to 30 frames per second. The camera image shows the recorded light of three 5 µm polystyrene beads. (see Reference 2) (c) The analysis of the camera signal (Raman spectra) is compared with a reference spectrum. (see Reference 2) (d) The OF2i® signal uses the speed of each particle to calculate particle size. (see Reference 1)*

REFERENCE PUBLICATIONS

1. Šimić M, Neuper, C, Hohenester, U, & Hill, C. (2023). Optofluidic force induction as a process analytical technology. Analytical and Bioanalytical Chemistry, 451(21), 5181-5191. DOI:10.1007/s00216-023-04796-3

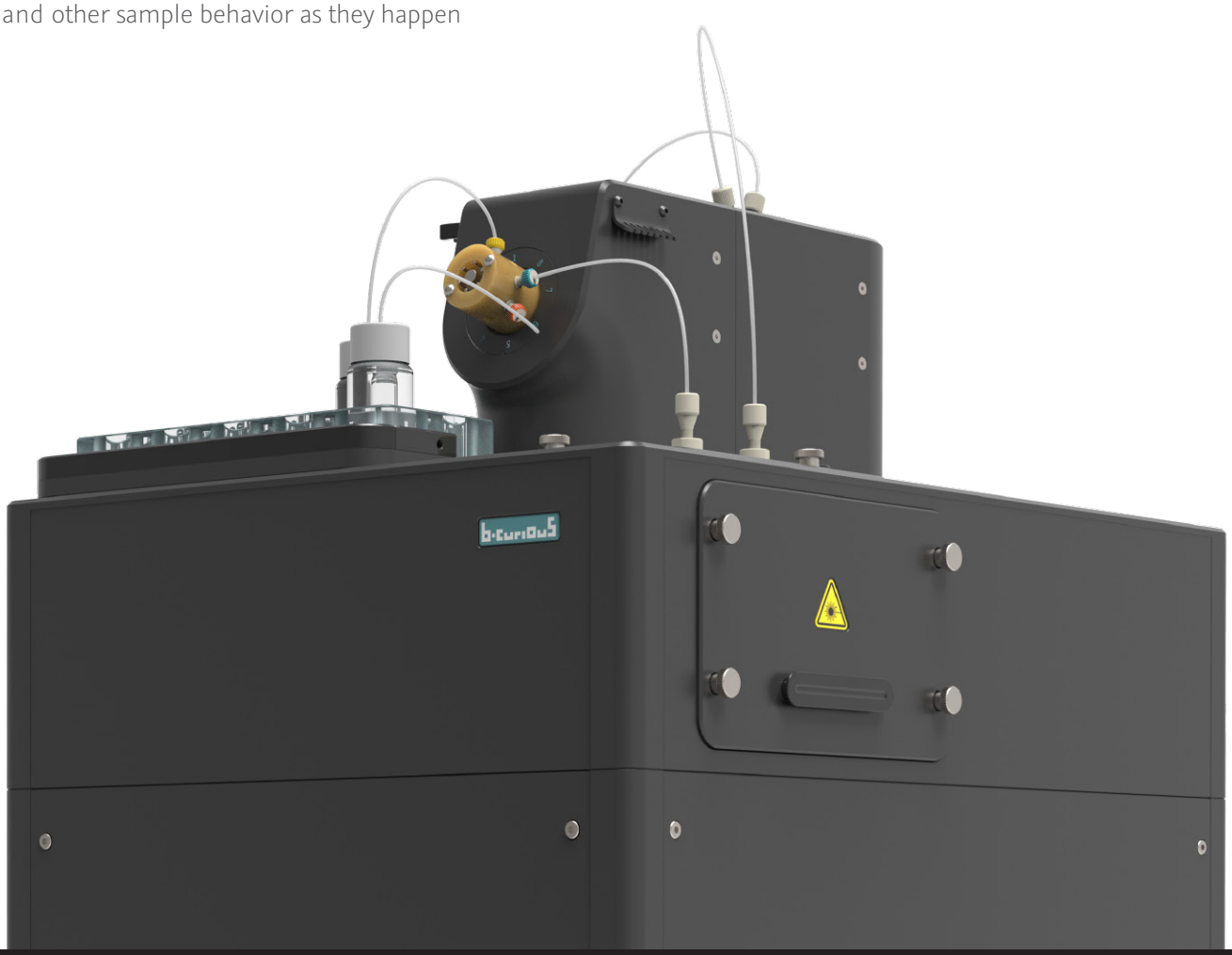
2. Neuper C, Šimić M, Lockwood T, Gonzalez de Vega R, Hohenester U, Fitzek H, et al. Optofluidic Force Induction meets Raman Spectroscopy and Inductively Coupled Plasma – Mass Spectrometry: A new hyphenated technique for comprehensive and complementary characterisations of single particles. Analytical Chemistry. 2024; doi: https://pubs.acs.org/doi/epdf/10.1021/acs.analchem.3c04657

BRAVE B-CURIOUS

Continuous number-based particle sizing with single-particle sensitivity

BRAVE B-Curious revolutionizes the measurement of particle size, PSD and particle concentration in the lab and gives you detailed insights into all the particle populations of your sample on a single-particle basis:

- Exact measurement of number-based particle size, particle size distribution as well as particle concentration
- Seamless measurement over seconds, minutes and even hours for automated, time-resolved and continuous PSD curves
- Determination of ultra-low concentrations (even a few particles per milliliter)
- Detection of single large particles including large-particle tails, anomalies and LPC
- Monitoring of kinetic processes such as aggregation, dissociation, crystallization, formation, dissolution and other sample behavior as they happen
- Reliable and representative measurement results, even for complex, polydisperse systems
- Automatic cleaning cycle that saves you time and effort
- Ideal documentation of measurement data in one report with raw data available for later analysis
- The possibility to use the same method in the lab as is used for online production monitoring, e.g. of nanoemulsions (PAT sensor)
- Additional Raman analysis module available (BRAVE B-Elementary)

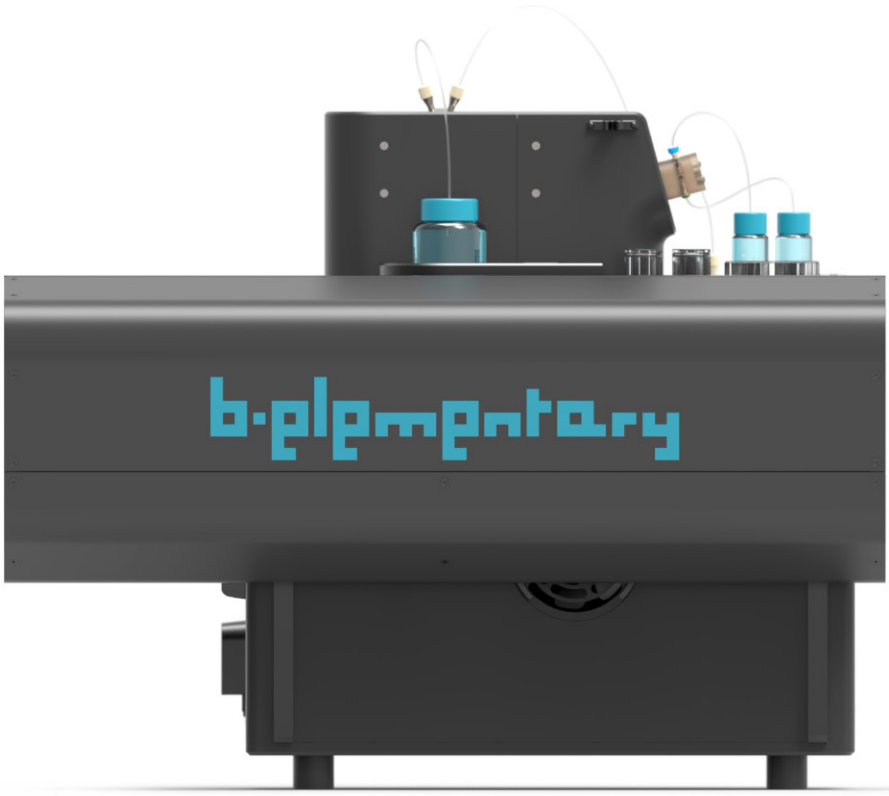


BRAVE B-ELEMENTARY

In-flow Raman analysis for people who hate sample preparation

BRAVE B-Elementary takes the hassle out of Raman analysis of particles by reducing the sample preparation to a minimum. It detects and identifies particles in-flow as sample passes through the measuring cell. This is the perfect tool for gaining insights into large sample volumes, e.g. for non-target screening on groundwater samples. It opens the door to in-flow particle analytics like never before.

- Continuous analysis in-flow directly in liquids
- Minimal or no sample preparation required
- Ideal for high-throughput screening
- Automated analysis with minimum user interaction
- Also for fluorescent samples
- Automatic cleaning cycle that saves you time and effort
- Raman analysis even on ultra-low concentrations
- Exact measurement of particle size, particle size distribution as well as particle concentration also available
- Future implementation into production processes as a PAT sensor



Coupling with ICP-MS

In cooperation with an Austrian university, we tested the coupling of an OF2i®-Raman device with ICP-ToF-MS. The initial results are promising and summarized in Neuper C, Šimić M, Lockwood T, Gonzalez de Vega R, Hohenester U, Fitzek H, et al. Optofluidic Force Induction meets Raman Spectroscopy and Inductively Coupled Plasma – Mass Spectrometry: A new hyphenated technique for comprehensive and complementary characterisations of single particles. Analytical Chemistry. 2024; doi: https://pubs.acs.org/doi/epdf/10.1021/acs.analchem.3c04657

BRAVE B-CONTINUOUS

PAT sensor for monitoring particle size distributions

BRAVE B-Continuous is directly integrated into the manufacturing process as an online PAT sensor. It brings all the benefits of OF2i® to your production plant and monitors production in real-time, faster and more accurately than ever before.

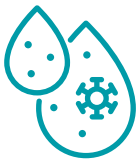
- Monitors particle size, number-based particle size distribution and particle concentration during production
- Detects ultra-low concentrations, aggregates and large-particle tails
- Eliminates the bottle-neck of offline lab analysis
- Helps optimize production and reduce out-of-spec product
- Gives you important insights into filtration and dilution systems and for predictive maintenance of your production plant
- Reliable and representative data with single-particle sensitivity
- Direct and easy integration to your production plant with a bypass connection
- Seamless measurement data in real-time 24/7
- Basis for Real-Time Release Testing
- Perfect documentation of measurement results

AREAS OF EXPERTISE

BRAVE B-Continuous is currently in use at a pilot plant producing pharmaceuticals. BRAVE B-Curious and BRAVE B-Elementary are at work in research and industry.

REAL-TIME PROCESS CONTROL

and automated QC in liquid (nano)particle production (e.g. emulsions, LNPs)



QUANTIFICATION & ANALYSIS

of nano- and micropollutants (e.g. degradation processes), water for injections, microplastics in fluids

AGGREGATION DETECTION

for R&D and production and for QC (e.g. monoclonal antibodies, proteins)

ENABLING NEW INSIGHTS & DISCOVERIES

and satisfying intrinsic curiosity in basic research and R&D (formation of e.g. LLPS, degradation processes of e.g. microplastics)

Manufactured by BRAVE Analytics, distributed in the UK and Ireland by **analytik**.