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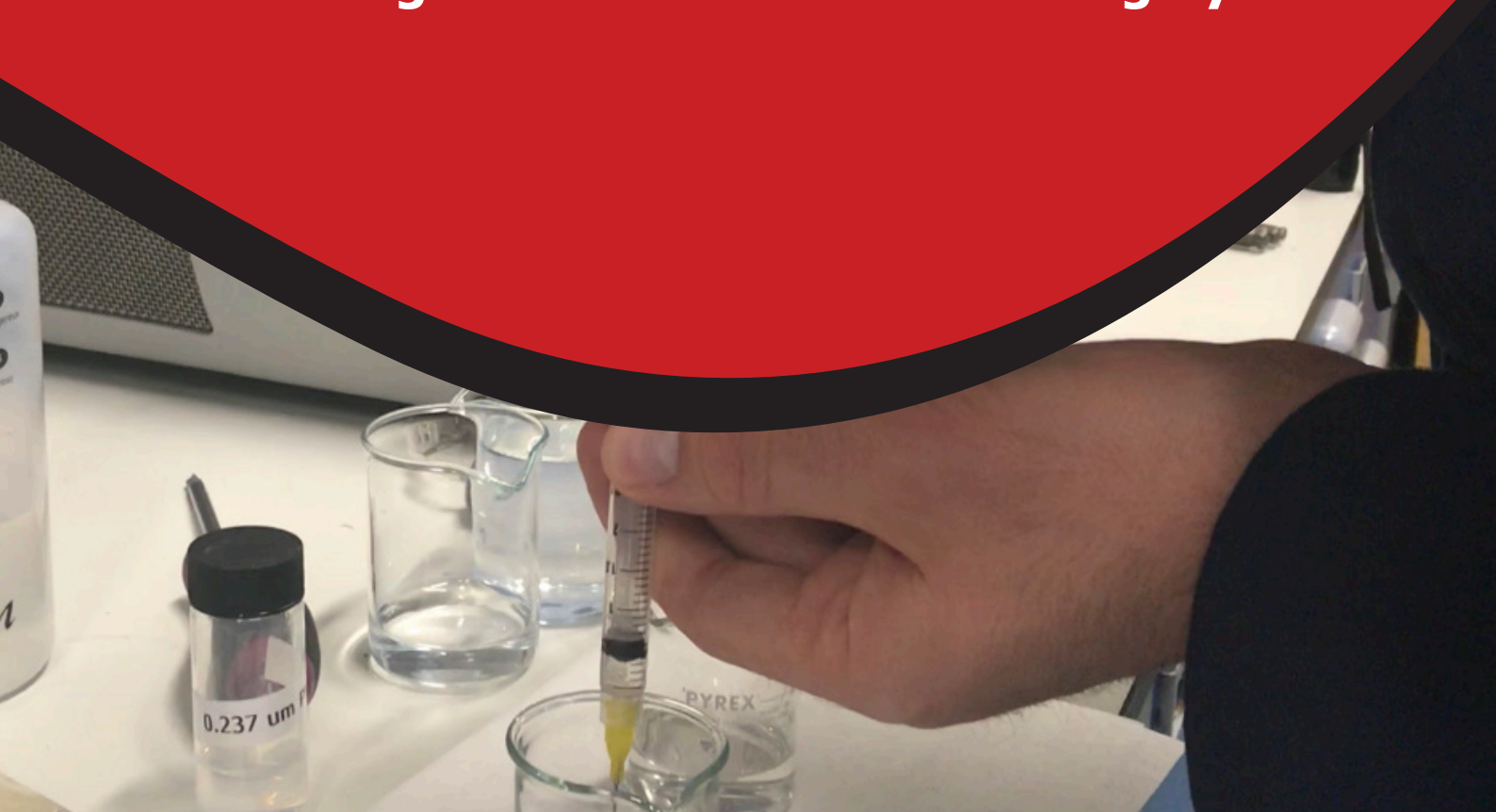
Solutions for Formulations

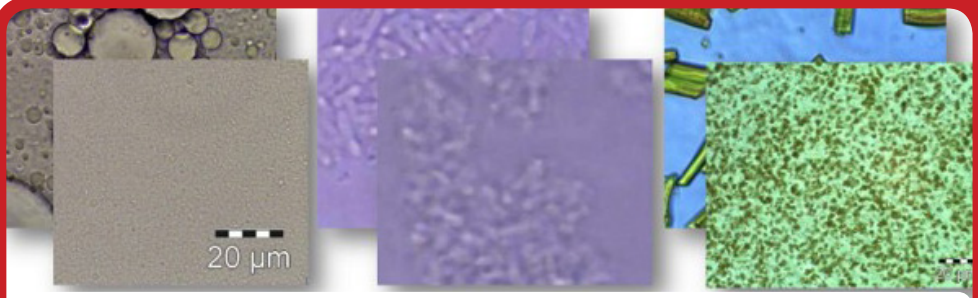
- High Shear Processing
- Automated Zeta Potential Titrations
- Particle Sizing in High Concentrations
- Ultra High Resolution Particle Sizing by DCS



Formulation Processing

Microfluidizer® high shear fluid processors/homogenisers are capable of achieving **unparalleled, consistent, dependable and scalable results** in the areas of submicron particle size reduction, dispersion, cell disruption and the narrowest particle size distributions.

The **'gold standard'** in nano-enabled applications for uniform particle size reduction, cell disruption and nanoemulsion formation, the Microfluidizer® is ideal for Active Pharmaceutical Ingredient (API) optimisation and Protein Production with improved down-steam processing. Microfluidizers have applications across a wide range of industries including Particle and Food Processing.



Nanoemulsions that can be sterile filtered

Cell disruption with high levels of protein recovery

Uniform particle size reduction

Microfluidizers ensure that every ml of material gets the same high shear treatment regardless of whether processing a 1ml batch or thousands of litres per hour.

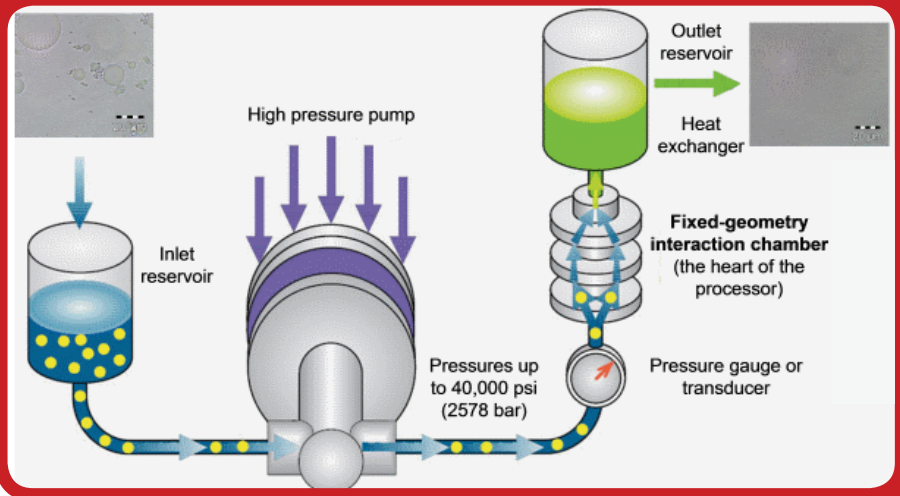
Performance

- ✓ **Fully scaleable from lab to production**
- ✓ **Consistent well-defined results**
- ✓ **Uniform nano-particle size reduction**
- ✓ **Stable nano-emulsion production**

Key Applications

- **Particle size reduction**
- **Nanoencapsulation**
- **Nanosuspensions**
- **Nanoemulsions**
- **Liposomes**
- **De-agglomeration**
- **Cell disruption**

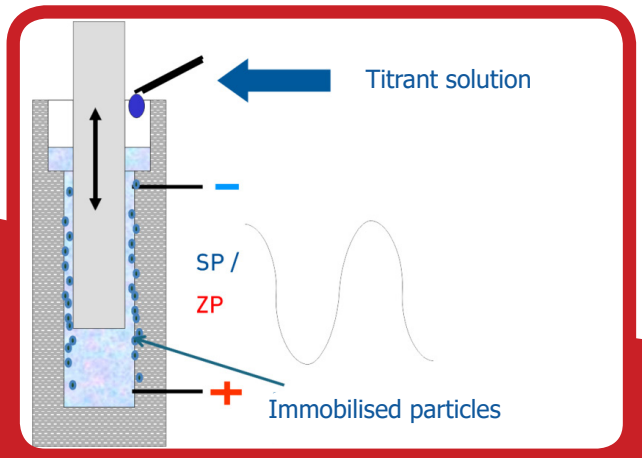
Proven results: up to 50% smaller particles than conventional homogenisers, uniform product output due to consistent shear and guaranteed scale-up.



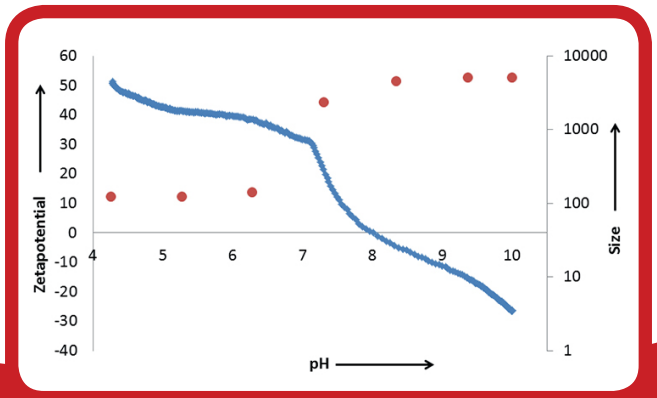
Formulation Optimisation

The **Stabino** is a streaming potential instrument for analysing and optimising the **stability of colloids and dispersions**.

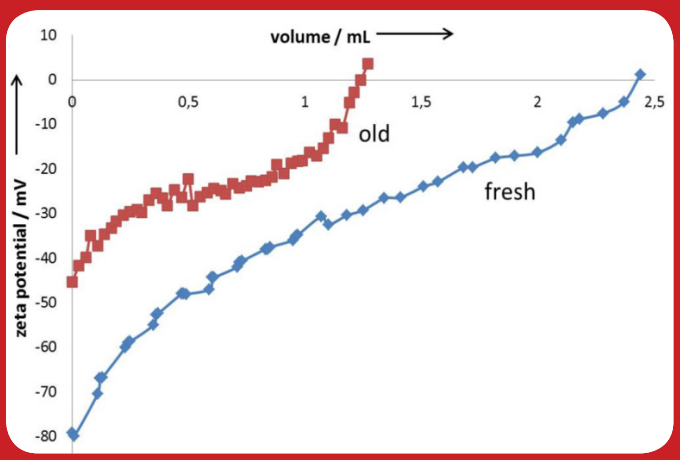
Employing a unique **oscillating piston design**, the system incorporates rapid pH and polyelectrolyte titrations for investigation of stable pH regions, iso-electric point (IEP), charge density and surface functionalisation. The system is ideally suited to formulation development and also has applications in quality control.



Particles become immobilised on the PTFE beaker and oscillating piston. The fluid stream moves the mobile ion cloud surrounding each particle, allowing the electrodes to measure streaming potential.



pH titration showing stable pH regions, determination of Iso-Electric Point (IEP) and effect of changing zeta potential on particle agglomeration.



Polyelectrolyte titration of 'old' and 'fresh' emulsions. PE titrations can determine charge density on the surface of colloidal particles and predict shelf-life and stability over time.

Key Applications

- **Re-agglomeration control**
- **Functional end group formulation**
- **Core shell design**
- **Colloid stability optimisation**
- **Iso-Electric Point determination**
- **Optimum coating applications**
- **Quality control of formulations**
- **Water research**

Performance

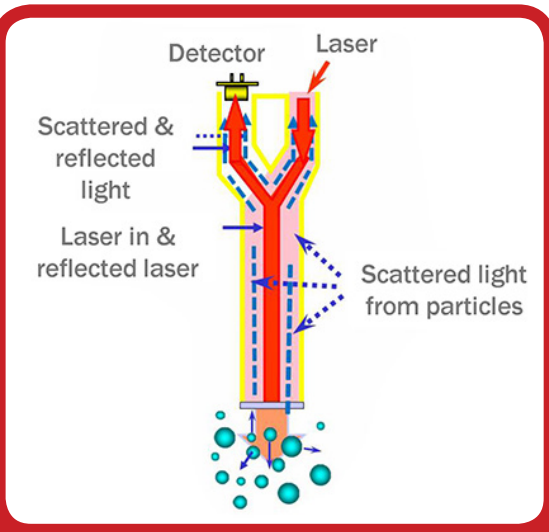
- ✓ **Fast pH & polyelectrolyte titrations**, calculate IEP or charge density **in minutes**
- ✓ **High resolution zeta potential plots**, based on accurate streaming potential measurements
- ✓ **Mix & Measure principle -** oscillating piston for continuous sample mixing avoids sedimentation

In-line Formulation Characterisation

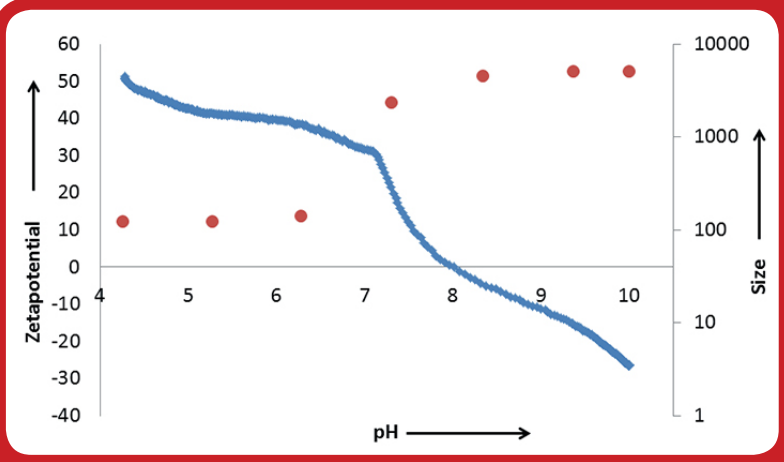
The **NanoFlex** is a **Dynamic Light Scattering (DLS) system** for measuring particle size distribution via a unique 180-degree heterodyne 'dip-in' probe for in situ measurements.

Colloids and dispersions are characterised effectively due to the high signal-to-noise ratio compared with conventional homodyne systems, as well as the 180 degree design, which eliminates the issue of multiple scattering.

The NanoFlex can be combined with the Stabino for **simultaneous analysis of zeta potential and size distribution**.



The measuring principle of the NanoFlex. The unique 180 degree back-scattering 'dip-in probe' design eliminates the problem of multiple-scattering and allows convenient in situ measurements of particle size distribution.



The NanoFlex can be combined with the Stabino zeta potential instrument to create a 'DUO-S' system, measuring zeta potential and its inherent relationship to particle size. This example shows how particles become less stable and agglomerate as zeta potential diminishes.

Key Applications

- **Organic/aqueous based dispersions**
- **Formulation production (in-line)**
- **Ceramics**
- **Polymers**
- **Pharmaceuticals**
- **Proteins**

Performance

- ✓ **180 degree 'probe' design -** in situ formulation measurement, without multiple-scattering of conventional DLS
- ✓ **In-line measurements -** IPAS accessory allows size measurements in-line or during mixing
- ✓ **High signal-to-noise ratio -** heterodyne design amplifies the signal by providing reference light to the detector

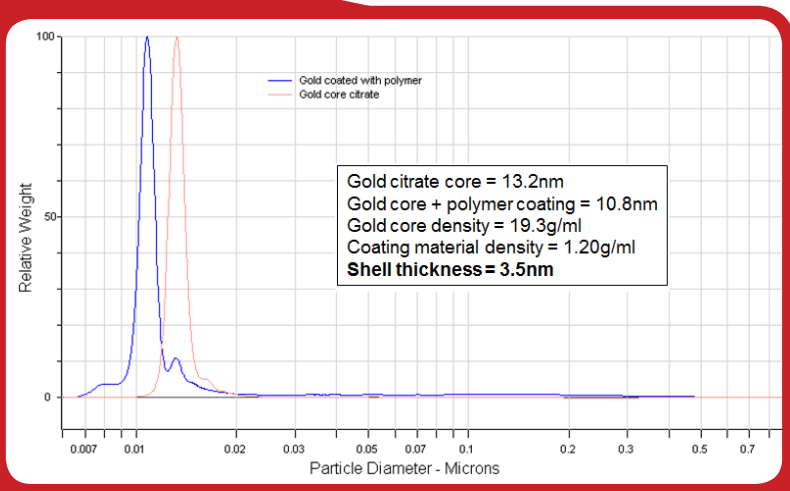
UHR Nanoparticle Characterisation

The **UHR CPS Disc Centrifuge** is an Ultra-High Resolution particle size analysis instrument, based on the principle of **Differential Centrifugal Sedimentation (DCS)**. Rather than using predictive algorithms, the CPS physically separates and characterises particles of different sizes, allowing resolution of peaks with as little as **2% difference in size**.

Highly poly-dispersed particles can be measured in the size range of ~3.0nm to ~60 microns, at 2 to 10 times better resolution than any other particle sizing instrument.

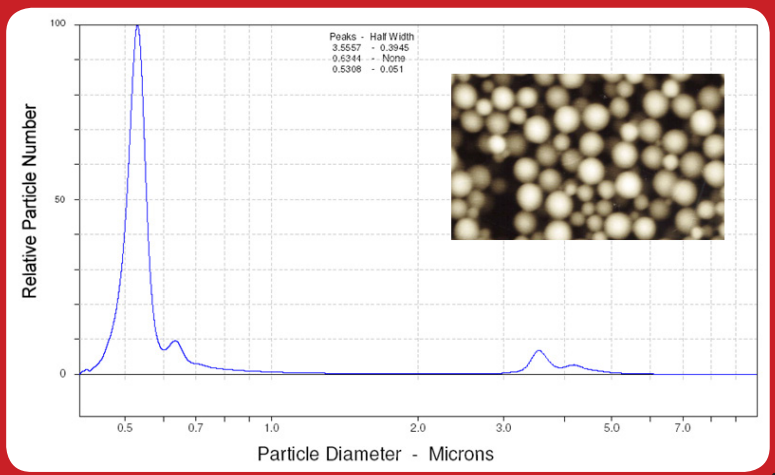
Performance

- ✓ **Ultra-high resolution particle sizing -** detect & measure subtle differences in particle size
- ✓ **Wide dynamic range -** broad & multi-modal distributions
- ✓ **Highly reproducible results -** consistent across different instruments & users



Ultra-high resolution capability of the CPS Disc Centrifuge allows calculation of coating/shell thickness, based on knowledge of the core and coating densities.

The CPS Disc Centrifuge is able to measure samples with a wide dynamic range, evidenced here in a measurement of a bi-modal silica sample, verified by TEM analysis.



Key Applications

- **Protein clusters**
- **Cell fragments**
- **Silica dispersions**
- **Oil emersions**
- **Carbon nanotubes**
- **Inks/pigments**
- **Gold/silver nanoparticles**
- **Micro-spheres**

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