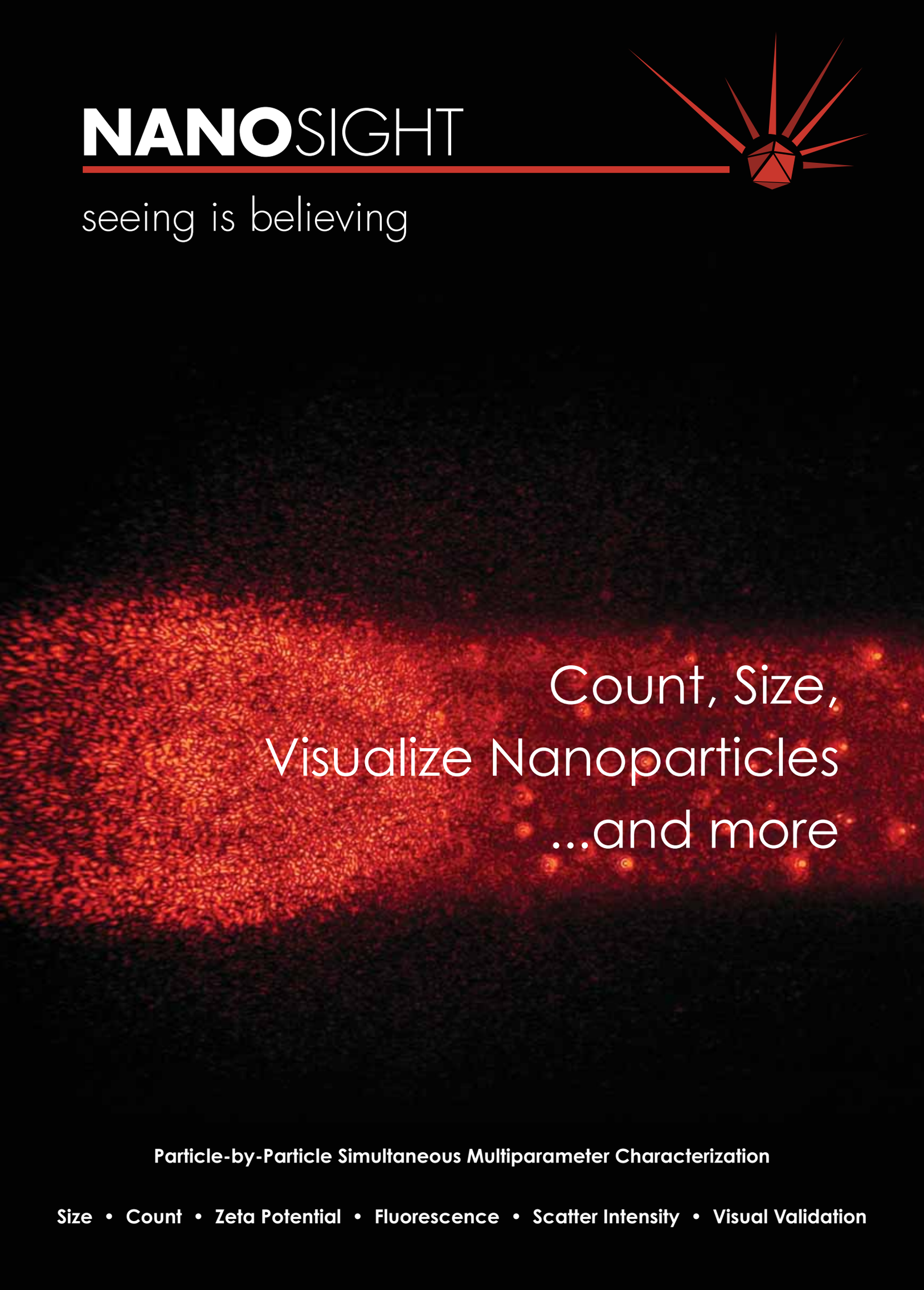
NANOSIGHT

seeing is believing



Count, Size, Visualize Nanoparticles ...and more

Particle-by-Particle Simultaneous Multiparameter Characterization

Size • Count • Zeta Potential • Fluorescence • Scatter Intensity • Visual Validation

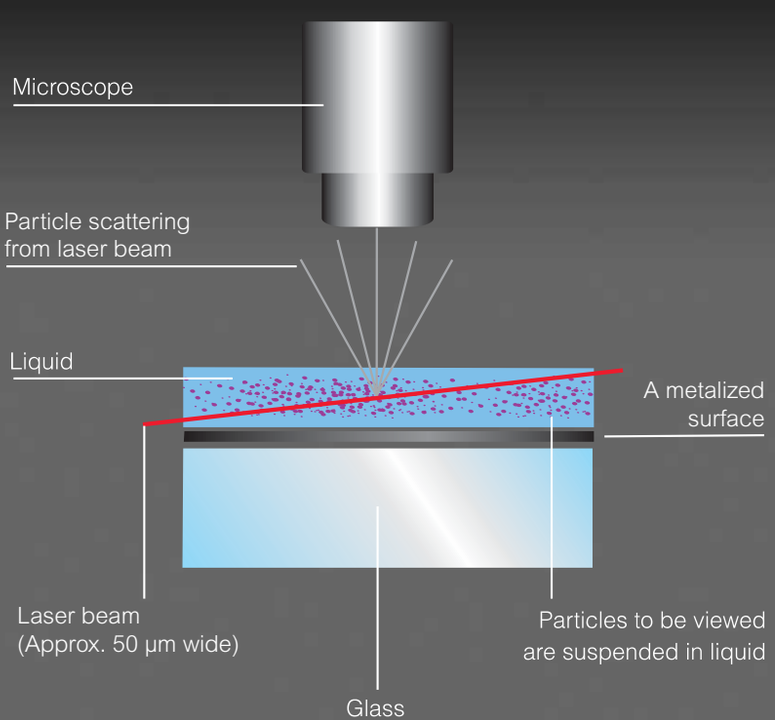
Nanoparticle Tracking Analysis (NTA)

NanoSight uniquely sizes and counts nanoscale particles in liquids. Zeta Potential can be measured simultaneously with size and concentration. Add suitable labeling, and the matching fluorescence mode enables particles to be differentiated against complex backgrounds. This particle-by-particle approach means Nanoparticle Tracking Analysis (NTA) provides high-resolution results, with minimal sample preparation. NTA delivers an unprecedented insight into true size distributions, even when the systems are complex and polydisperse, and supports the exclusive numerical data with corroborating images.

High-Resolution Size Analysis of Complex Dispersions

NanoSight instruments use a laser light source to illuminate nanoscale particles. Enhanced by a near-perfect black background, the particles appear individually as point-scatterers moving under Brownian motion. Polydisperse and multimodal systems are instantly recognizable and quantifiable. Fluorescence mode can be used to discriminate populations under scrutiny from non-labeled background. Three wavelengths can be used to excite fluorescence (405nm, 532nm and 638nm) and the fluorescent emissions can be imaged from particles which have been suitably labeled.

The NTA image analysis software automatically tracks and sizes many particles simultaneously. Results are displayed as frequency size distributions and output to spreadsheet. Supplementary scatter intensity data is combined with these size distributions to provide 3D plots which highlight subtle differences in populations between samples. Application of an electric field provokes electrophoretic particle movement and allows Zeta Potential to be determined; again this measurand is particle-by-particle. Video clips of images are recorded and retained for further analysis - for example video clips visit www.nanosight.com



Analysis image of a clearly polydisperse material, showing the wide range of scattering intensities (Titanium Dioxide in water).

Capabilities of NTA Measurements

- **Direct and live view of particles in suspension**
- **Particle-by-particle, high-resolution particle sizing**
- **Especially applicable to polydisperse systems**
- **Measurement of concentration and particle count**
- **Zeta Potential measurement**
- **Fluorescence Mode**
- **Scattering intensity distribution**
- **Evidence of non-sphericity and aspect ratio**

The direct observation of particle motion and scattering behavior provides a wealth of additional information. These real-time observations validate the reported particle size distributions and provide instant insight into polydispersity and state of aggregation. Measurements take just minutes allowing time-based changes and aggregation kinetics to be quantified.

Comparison to Traditional Methods

NTA is not DLS/PCS (Dynamic Light Scattering/Photon Correlation Spectroscopy), although both are informed by Brownian motion. Whilst DLS measures change in scatter intensity of the bulk sample, NTA measures observed particle diffusions directly, particle-by-particle. Consequently, NTA has these features:

- **Overcomes intensity-biased results seen in DLS/PCS**
- **Size is calculated particle-by-particle**
- **Provides high-resolution measurement of distribution**
- **Direct measurement without modeling or assumptions**
- **An absolute method not requiring calibration**
- **Immune to interference from dirt and aggregates**
- **Requires no information about collection angle, wavelength or solvent refractive index**
- **Minimal sample preparation, with automation capability**

NanoSight measures the diffusion coefficients of individual particles and builds the distribution profile one particle at a time. This compares favorably with an ensemble measurement of the combined light scattering intensity of a population of particles. Consequently, rather than presenting an ideal curve driven by a range of assumptions, NanoSight's results are a true high-resolution particle size distribution. This methodology is especially strong in characterizing complex and polydisperse systems.

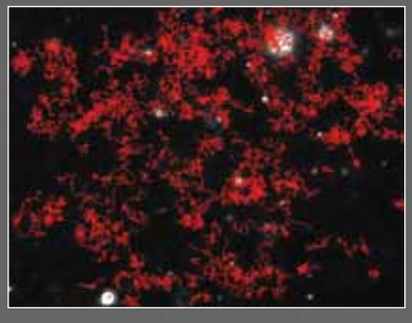
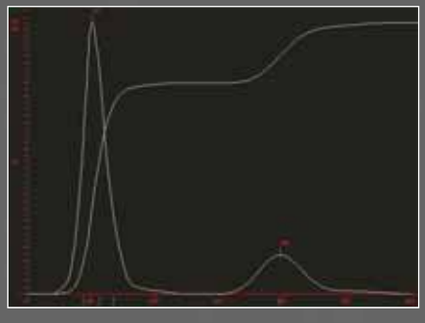
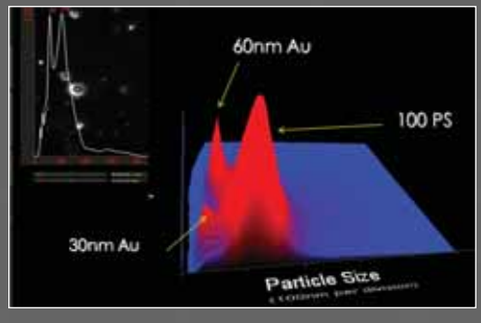


Image of a suspension of 100nm and 400nm polystyrene particles in water. The trajectories of the 100nm particles are shown from which their size is measured. The larger 400nm particles can clearly be differentiated from the smaller particles as they appear brighter and larger.



Screenshot of particle size distribution with 100nm and 400nm polystyrene particle mixture analyzed by the LM20 (of 101nm and 395nm). The two population peaks can be identified clearly.



Scattered intensity vs. size graph showing three distinct populations. In this mixture two populations of gold nanoparticles at 30nm and 60nm are differentiated from 100nm polystyrene particles by both size and scatter intensity.

NanoSight Instrument Range

NS500

LM20

LM10

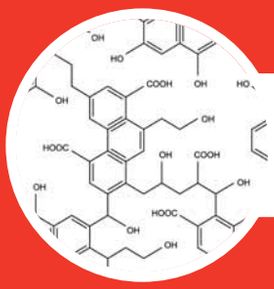
NTA Software

SPECIFICATIONS	NS500 SERIES	NS200	LM10	LM10-HS	LM20
Concentration Range	Greater than 10^7 particles per ml	Greater than 10^7 particles per ml	Greater than 10^7 particles per ml	Greater than 10^7 particles per ml	Greater than 10^7 particles per ml
Software	NTA	NTA	NTA	NTA	NTA
Alignment	Automated	Fixed	Manual	Manual	Fixed
Medium	Water-based	Any Non-Corrosive Solvent	Any Non-Corrosive Solvent	Any Non-Corrosive Solvent	Any Non-Corrosive Solvent
Sample Volume	500µl	500µl	500µl	500µl	500µl
Laser Output (Class One Laser Products)	Red, 40mW at 638nm		Blue, 60mW at 405nm		Green, 75mW at 532nm

Full specifications of the complete range are available at **www.nanosight.com**

OPTIONS	NS500 SERIES	NS200	LM10	LM10-HS	LM20
Zeta Potential	Yes	No	No	No	No
Fluoresence Mode	Yes	Yes	Yes	Yes	No
High Sensitivity Camera	Standard	Standard	Yes	Standard	No
Temperature Control	Standard	No	Yes	Yes	No
Laser Options	Red/Blue/Green	Red/Blue	Red/Blue/Green	Red/Blue/Green	Red/Blue
Sample Introduction and Auto-Clean Fluidics	Standard	No	No	No	No

Protein Aggregation

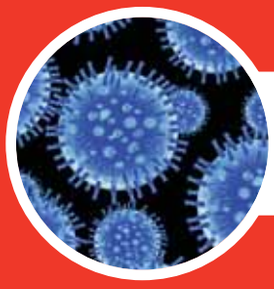


Protein aggregation can occur during many unit operations in the biological manufacturing processes: cell culture, purification, formulation, packing and storage. Determining the state and kinetics of aggregation can improve product stability and provide significant gains in process optimization. NanoSight provides size and count of protein aggregates in the region of 30-1000nm.

Drug Delivery

Particle size distribution is at the heart of realizing the benefits of targeted drug delivery. NanoSight provides high-resolution particle size distribution, concentration measurement and particle-by-particle Zeta Potential across the range of sizes employed in delivery vehicles such as liposomes and polymeric nanoparticles.

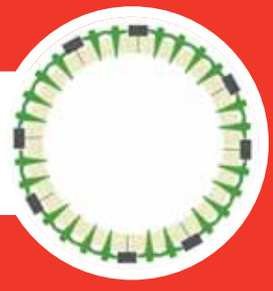
Virology and Vaccines



Counting and sizing viruses, bacteriophage and their aggregates is important in the development and validation of vaccines and phage therapeutics. NanoSight provides total viral count in just minutes, providing a rapid alternative to traditional methods measuring infective titer. Quantitative measurement of dispersion quality or of any aggregation is validated by real time observations.

Exosomes and Microvesicles

The cell signaling function of microvesicles and nanovesicles (exosomes) points increasingly to their potential as biomarkers. NanoSight visualizes and counts these particles, providing fast and robust characterization down to approximately 30nm. Qualitative data is provided at an order of magnitude below the detection limits of conventional flow cytometry, whilst suitable fluorescent labeling permits bioparticle speciation.



Nanoparticle Toxicology

Particle size, concentration and degree of aggregation all influence the biological response to nanoparticles and the resultant potential health implications. NanoSight provides these measurands at high-resolution with visual validation of the data. In fluorescence mode - NanoSight can differentiate labeled-particles from complex background, making it suitable for study of particles in a biological relevant fluid.

Ecotoxicology

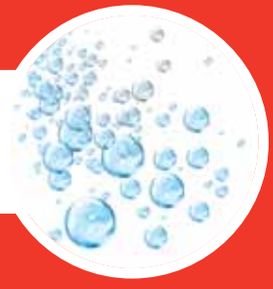
Understanding the fate, particle aggregation, size and concentration of engineered nanoparticles in the natural environment are key parameters in ecotoxicology. NanoSight's ability to measure concentrations down to 10^7 particles per ml, to count aggregates and to operate in fluorescence mode make it increasingly employed in this area of research.

Inks and Pigments

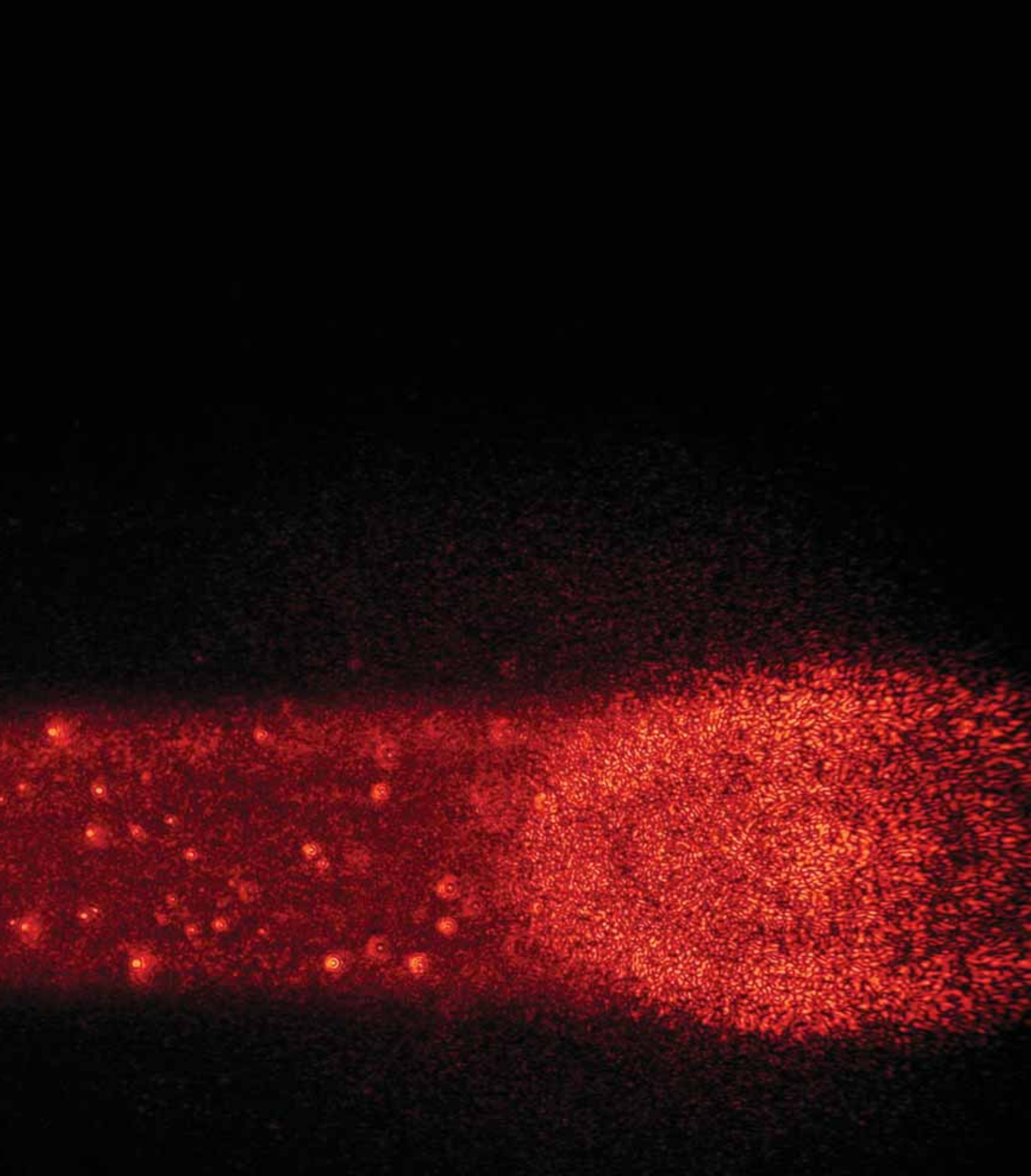
Particle size and concentration are important features in inkjet applications. Particle size influences the strength of color and particle aggregates may also cause nozzle blockage. The high-resolution size distributions, as generated by NanoSight, are proving to be key in this application.

Nanobubbles

Nanobubbles have a wide ranges of applications including drug delivery, cleaning and sterilization. NanoSight can visualize nanobubbles directly in solution, measure bubble size particle-by-particle and report concentration.



Detailed application notes are available at **www.nanosight.com**



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NanoSight Ltd, Minton Park, London Road,
Amesbury, Wiltshire SP4 7RT, UK

T: +44 (0)1980 676060
E: enquiries@nanosight.com

www.nanosight.com