Mobility

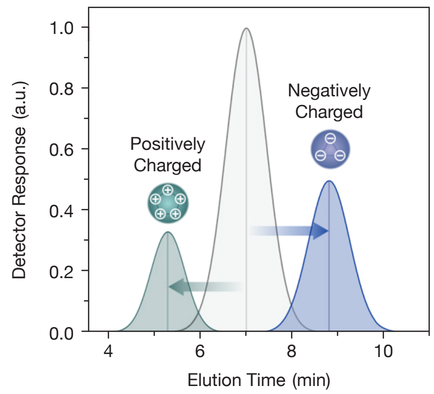
Electrophoretic mobility, zeta potential
and charge distributions

WYATT
TECHNOLOGY

Mobility™

Separate according to size and charge with EAF4

Mobility works with an Eclipse™ FFF system to determine not just size, but also electrophoretic mobility of nanoparticles and macromolecules. It does so by adding an electric field in a special FFF channel to realize electrical/asymmetric-flow FFF (EAF4). For heterogeneous samples, EAF4 provides the zeta potential of each population.



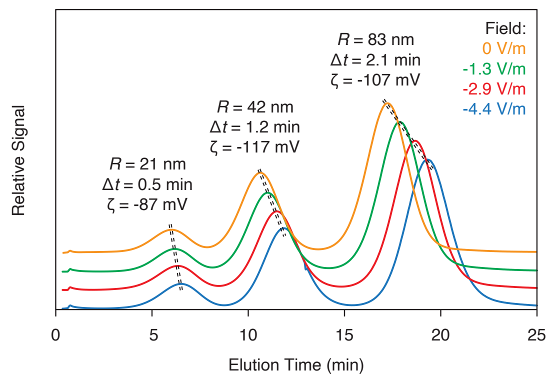
In EAF4, the zero-field retention time (grey peak) is determined by the particle's hydrodynamic radius. Application of an electric field to the EAF4 channel shifts the retention time according to the sign and magnitude of the particle's charge.

The benefits of EAF4

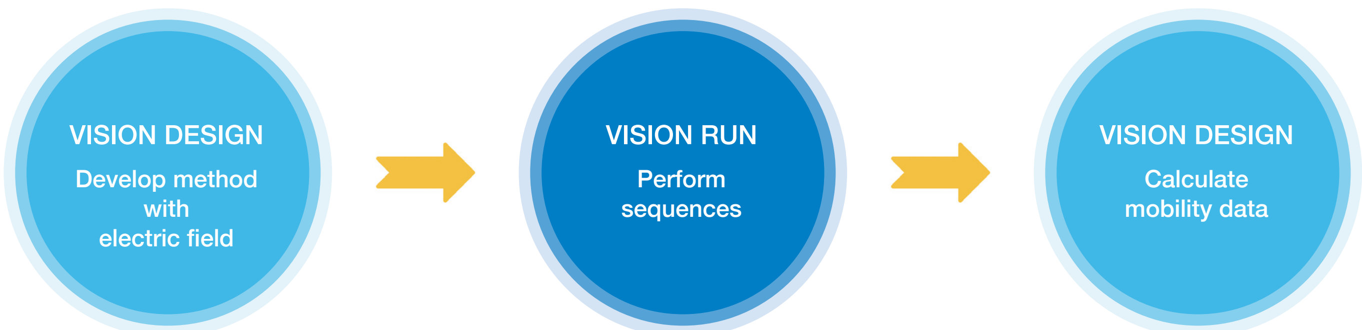
Charge is an important property of nanoparticles as well as proteins and oligonucleotides. It is the main driver of colloid stability and interactions, and critical for ensuring efficacy and safety of nanomedicines. EAF4 is the only method which can determine both size and charge, simultaneously, of each component in complex samples, whether the components are distinguished by size, charge or both.

Use Mobility to:

- Understand if all components in the sample have similar surface chemistry
- Evaluate N/P ratio of drug and gene delivery nanoparticles
- Assess biopharmaceuticals for chemical and physical degradation



The shift in retention time due to the electrical field is analyzed automatically to determine zeta potential and electrophoretic mobility of each eluting peak. Shown here is the analysis by EAF4 of a mixture of three polystyrene nanoparticles, resulting in both size and zeta potential determination of each component.



EAF4 workflow with VISION™. VISION DESIGN calculates the expected shift in elution time due to applying electric and cross-flow fields in the Mobility Channel, to a sample with a given size and charge. VISION RUN performs the set of experiments and stores the data in a single file. VISION DESIGN automatically processes the complete series of experiments, calculating size, mobility, zeta potential and charge.

Mobility Advantages

Engineered for reliability and robustness

Mobility measures pH and conductivity with software-supported calibration

Constant-current and constant-voltage mode for conductive and non-conductive solvents

Titanium channel frame engineered for maximum performance

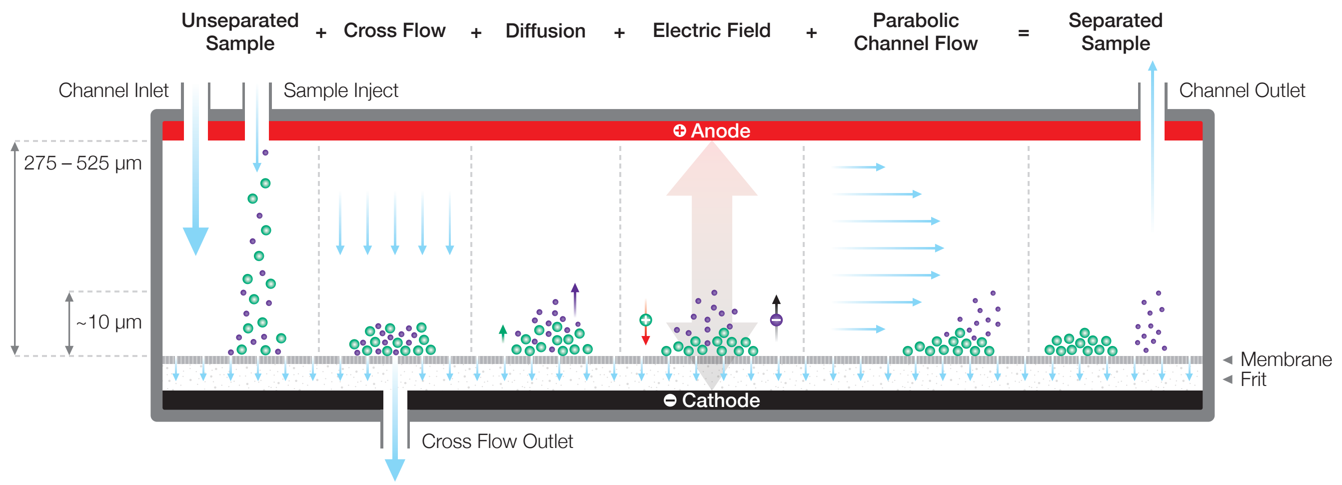
Automated data processing in VISION DESIGN

Platinum electrodes guaranteed for the lifetime of the channel

Temperature regulation and Dilution Control port included

How EAF4 Works

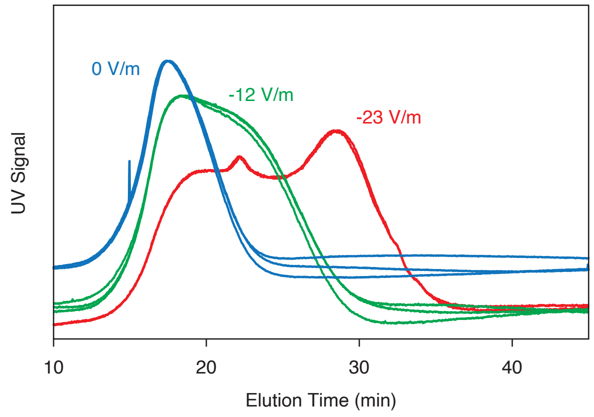
Adding an electrical field to the cross-flow field



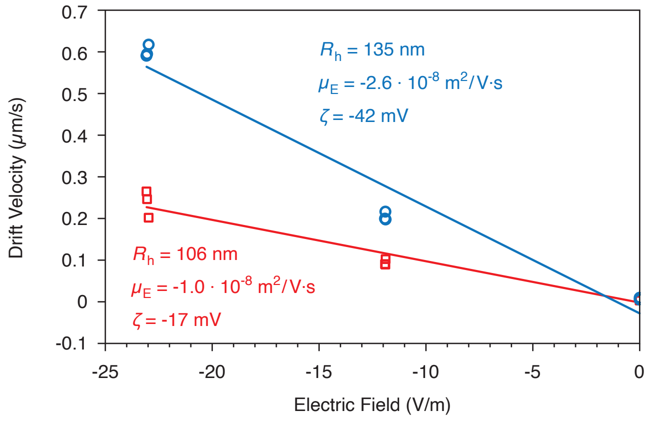
In EAF4, an electrical field is applied parallel to the cross-flow so that sample components experience a force proportional to their charge. Depending on polarity, this force may be directed up or down, leading to an increase or decrease of average height above the membrane and a corresponding shift in retention time.

Hydrodynamic size is calculated from the retention time at zero applied field, while electrophoretic mobility and zeta potential values are derived from the magnitude of the shift relative to the applied electrical field. This analysis is carried out for each identifiable population within a fractogram.

Liposome Analysis



A liposome preparation was measured at 0, -12 and -23 V/m. Though the zero field signal seems fairly homogeneous, a shoulder emerges with increasingly negative electric field, indicating two populations with different zeta potentials, both with negative charge.



VISION DESIGN automatically calculates the size, mobility, net charge and zeta potential for both populations. The measurement reveals a 2.5 fold difference in zeta potential.

Specifications

System Components	Mobility Module, Mobility separation channel
Mobility Module	Includes power supply plus pH and conductivity sensors with software-supported calibration. Power supply maximum voltage ± 30 V, maximum current 30 mA; constant-current or constant-voltage mode.
Wetted Materials	PEEK
Communications	Ethernet
Inputs/Outputs	16-bit A/D input, external temperature sensor
Mobility Channel	EAF4 channel engineered with titanium frame and platinum electrodes
Temperature Regulation	From ambient to 50 °C
Wetted Materials	Titanium, platinum, fused silica, polyetherimide, alumina ceramic, PTFE, Viton, polycarbonate
Spacers	FFKM perfluoroelastomer-coated polycarbonate; available thicknesses: 275, 400 and 525 µm
Membranes	Pre-cut polyethersulfone or regenerated cellulose with molecular-weight cutoff from 2 to 30 kDa. Templates available to cut other materials to size.
Compatibility	
Hardware	Compatible with Eclipse (NEON)
Software	VISION 3 or newer
Dimensions	25 cm (L) x 26 cm (W) x 9 cm (H)

Wyatt Technology is committed to continual improvement. Specifications subject to change without notice.

Warranty: All Wyatt instruments are guaranteed against manufacturing defects for 1 year.

Left to Right
Geofrey K. Wyatt, Chief Executive Officer
Dr. Philip J. Wyatt, Chairman of the Board
Clifford D. Wyatt, President

Wyatt Technology provides absolute macromolecular and nanoparticle characterization solutions by developing the finest instrumentation and services to chemical, petrochemical, pharmaceutical, biotechnological and academic laboratories worldwide. We delight our customers with unparalleled levels of service and support, facilitating their cutting-edge research and development efforts.

Mobility is one of many tools in Wyatt's Light Scattering Toolkit used to characterize proteins, polymers and nanoparticles in solution.

Learn more at www.wyatt.com

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