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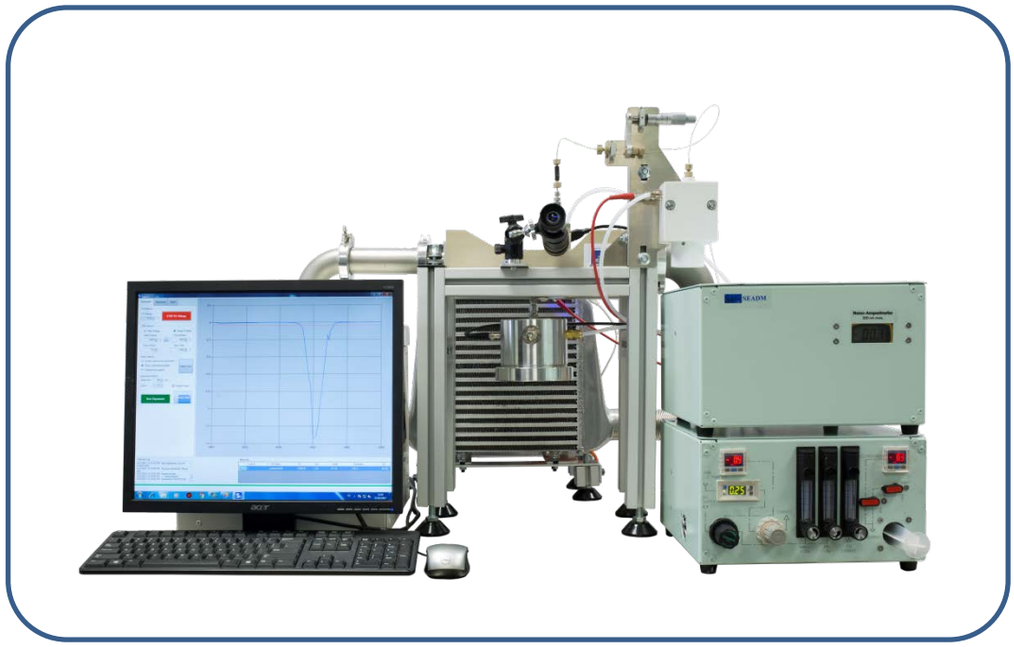
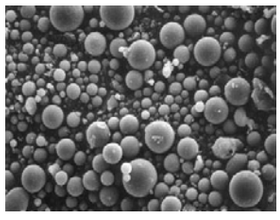
DMA P5 System
Planar Differential Mobility Analyzer



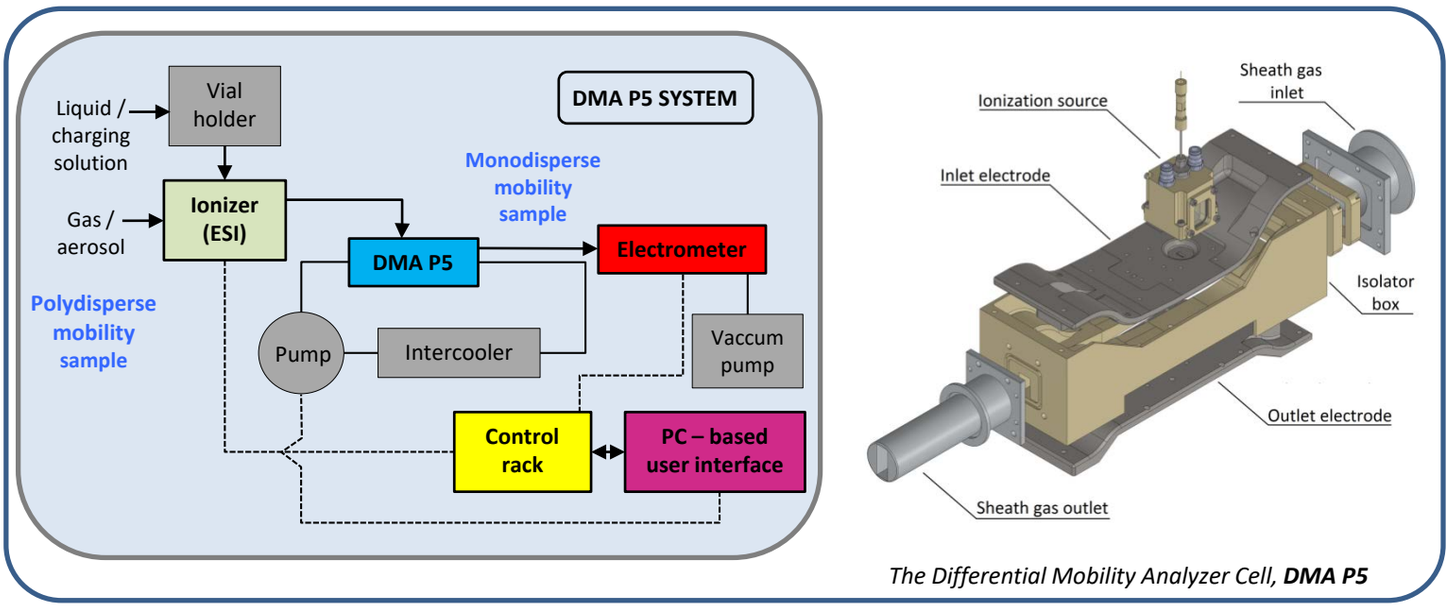
Ultra high resolution, high transmission analysis of nano-particles and molecules



DMA P5 SYSTEM

A high performance DMA for classification of 1 nm particles

SEADM's DMA P5 delivers the highest resolution and transmission available in the market even of ions and particles 1 nm in diameter, still at affordable costs. DMA P5 is particularly well suited for high space charge or high concentration sources of nanoparticles, such as electrospray, laser ablation, flames, etc.



The Differential Mobility Analyzer Cell, ***DMA P5***

In the **P5** parallel plate **D**ifferential **M**obility Analyzer (**DMA**), sampled charged molecules or particles are subject simultaneously to a gas flow and an electric field, such that only those with a specific mobility are transmitted into the DMA outlet (Figure 1). The planar geometry permits direct access to the aerosol at the inlet and outlet. This feature results in **much higher transmission than in more conventional cylindrical DMAs,** particularly when using sources with high space charge (electrospray, sparks, …) or rapidly evolving aerosols (flames, laser ablation, etc.). The planar geometry is also ideally suited for tandem operation with a mass spectrometer (**DMA-MS**), or in tandem DMA.

The P5 DMA has been designed to deliver **laminar flow at Reynolds numbers beyond 200,000.** This supercritical feature enables the achievement of **ultra-high resolving powers** (exceeding 100), providing access to small molecules and clusters, poorly resolved by traditional DMA's.

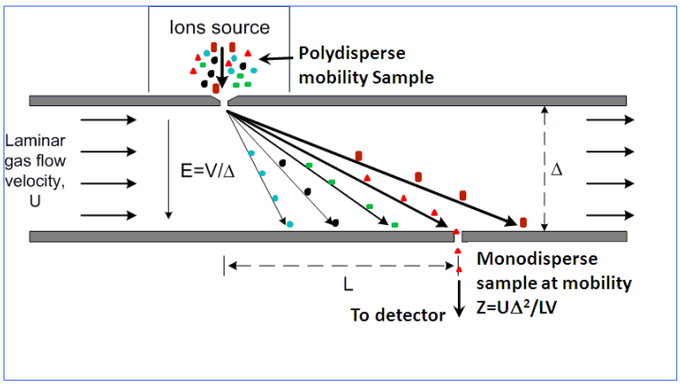


Fig. 1 *The DMA principle for sensitive and selective separation of molecules / nano - particles*

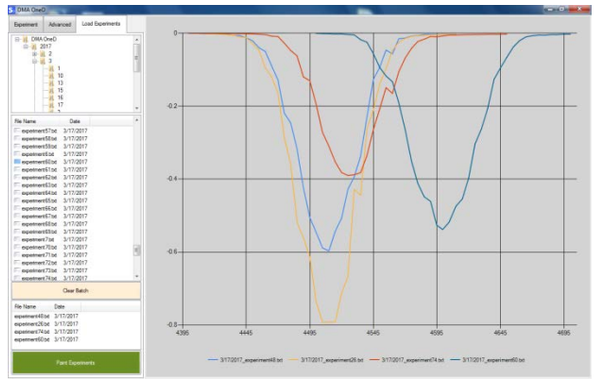


Fig. 2 *PC software, for presentation of results.*

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Advantages and features

• **Ultra-high resolution** (see results for THA+ test ion on Figure 3), yet an ability to cover the size range up to 5 nm (singly charged).

• **Unbeatable transmission,** >50%

• Extremely **short, best-in-class, ion residence times** (200 μs) avoiding the formation of physically or chemically-induced artifacts. *"You measure what you sample and you do not measure anything you don't"*

• **Fast response** (<1 ms) enabling scanning in conjunction with fast scanning instruments like MS. The DMA P5 can be tailored and coupled with your MS* to obtain 2D mobility-mass spectra (Fig. 4).

• **Stand alone operation** (control and monitorization units built-in) made easy: directly connected to PC-USB.

• **Operational temperature** up to 160ºC

Applications and sectors

Range of applications include:

+ **Atmospheric/climate** research
+ **Combustion** (including nucleation studies)
+ **Nucleation** and growth of particles.
+ **Synthesis** of nanoparticles
+ CPC calibration.
+ **Environmental/pollution** research.
+ **Ultra-small nano-particles** applications: medical imaging, drug delivery, catalysis, etc.
+ **Biomolecule** analysis
+ Particle **standards**

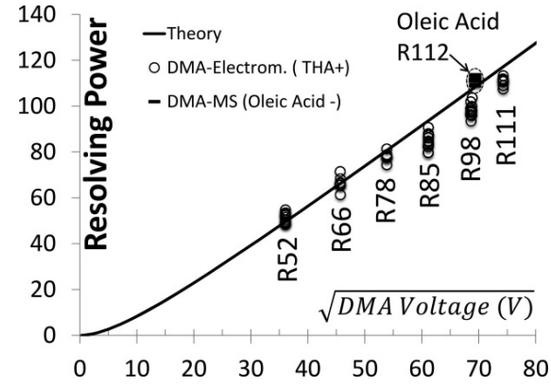


Fig. 3 *Resolution (resolving power) as a function of the square root of the DMA voltage. The circles and horizontal segments represent the experimental data. The continuous line represents the ideal theoretical resolution. Resolution expressed as (peak voltage)/FWMH. [Amo, 2018]*

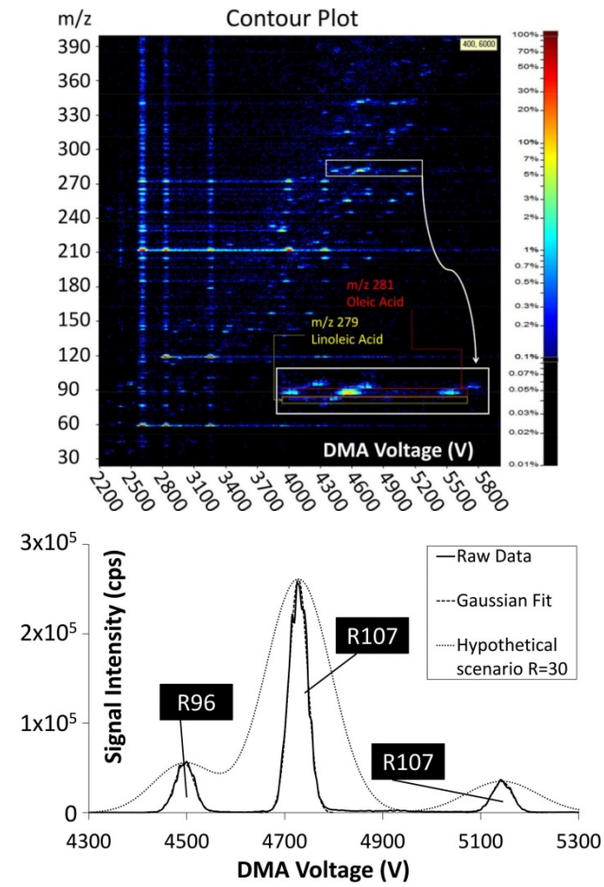
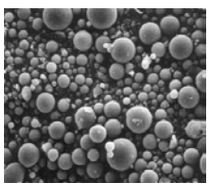
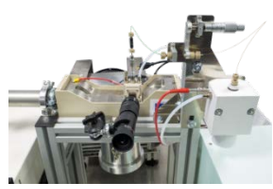


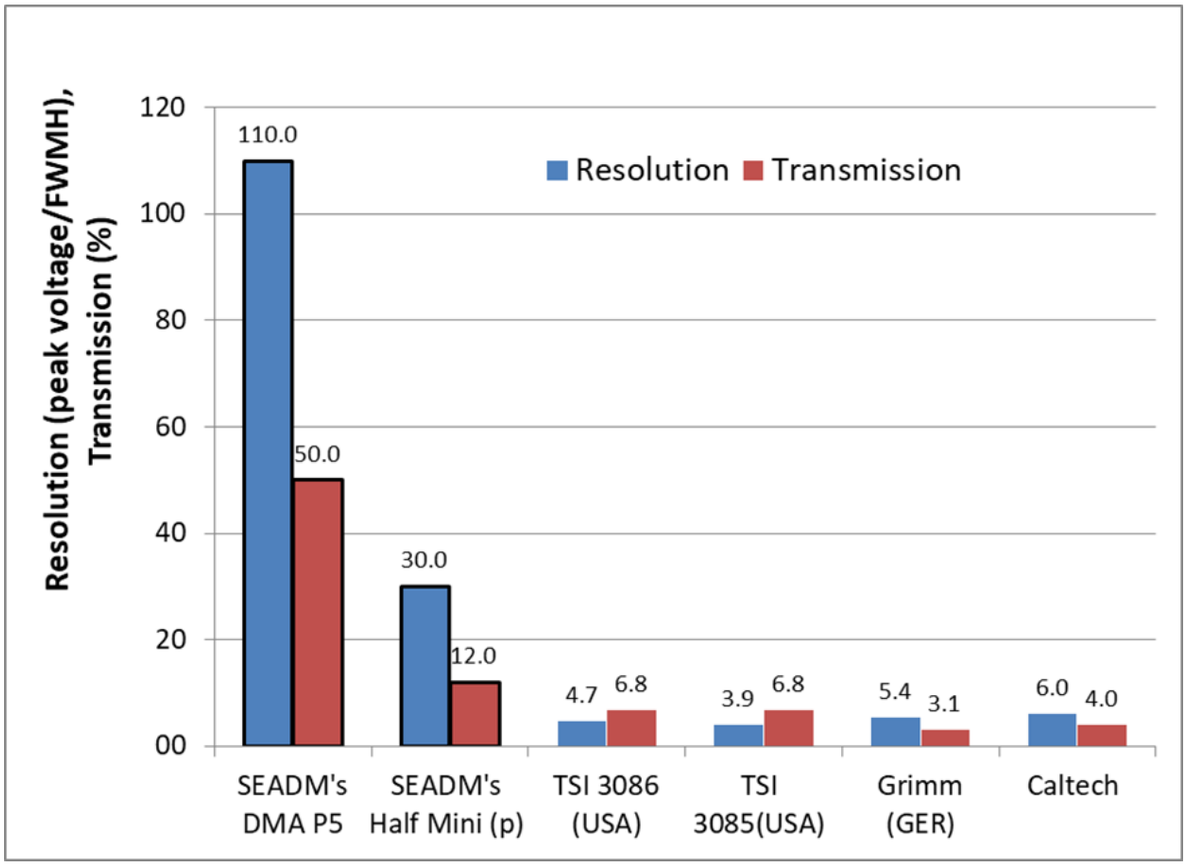
Fig. 4 *(upper) Electrospray DMA-MS contour plot of the extra virgin olive oil solution, including a magnified version in the mass region for oleic and linoleic acids; (lower) Background-subtracted mobility spectrum at m/z 281.3 (oleic acid). The dotted line represents the same peaks with a hypothetical resolving power of 30. [Amo, 2018]*


** Currently, interfaces –including hardware and software- are available for Bruker Impact HD, Shimadzu LCMS 2010, Thermo Fisher Orbitrap, some Tofwerk and many of Sciex range mass spectrometers. If your favorite MS is not in this list, we will carry out the integration study for you.*

Benchmark

SEADM's DMA P5 puts reference performance at your fingertips:



Customer review

Juha Kangasluoma, University of Helsinki, (Kulmala's Group)

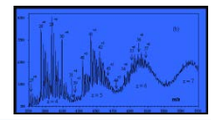
"I am a happy customer of SEADM products. In our laboratory at the University of Helsinki we use daily the electrometers, and Half-mini and P5 DMAs manufactured by SEADM. Our DMA P5 is the front end of a commercial mass spectrometer. SEADM tailored the interface between the DMA and mass spec specifically for us, which to my great pleasure was implemented without any problems. We use the DMA P5 in electrospray and cluster dynamics research."

Anne Maisser, formerly at the University of Vienna, now with Cyprus Inst.

"We used a DMA P5 to size select atomic ions for further investigation of the nucleation / condensation process in an expansion type condensation particle counter. This project required the high resolution and high transmission of this instrument to get sufficient and monodisperse ions into the expansion chamber for recording the growth of the activated ions using light scattering measurements.

All ions measured had sizes in the sub nanometer range and thus other commercially available ion mobility spectrometers that operate at atmospheric pressure would not have met our needs in terms of resolution or transmission. This enabled experiments at a new level of accuracy and precision. SEADM was very helpful with making this project possible."

DMA P5 SYSTEM



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Larriba, C., Hogan C. J.; Attoui, M., Borrajo, R., Fernandez Garcia, J., Fernandez de la Mora, J. The Mobility-Volume Relationship below 3.0 nm examined by Tandem Mobility-Mass Measurement; Aerosol Science and Technology Volume 45, Issue 4, 2011

Hogan Jr. C.J., Ruotolo B., Robinson C.; Fernandez de la Mora, J. Ion Mobility Measurement of the GroELTetradecameric Complex by Tandem Differential Mobility Analysis Mass Spectrometry
American Society for Mass Spectrometry Conference May 2010 (ASMS 10)

Amo, M.; Fernández de la Mora, J. Limits to the chemical background and the mobility-selected current transmitted in a Differential mobility analyser (DMA); 62nd ASMS Conference on Mass Spectrometry and Allied Topics; Baltimore, USA; Jun 2014

Specifications

DMA type: planar (parallel plate)
Particle size range: 0-5 nm (*)
Resolution: 110 (peak width)/FWMH with standard THA+ ion (approx. 1 nm size and Z=0.97 V / (cm^2 s)
Operational time: 5 minutes (for start up) (Less than 1 minute for 1D-spectra analysis).
Sheath flow rate: 300-1.500 lpm
Clean gas supply for sample gas: 0.1 to 5 Lpm (in case of higher flow rates please consult)
Power supply: 230 Vac, 1250 W.
DMA dimensions (cell): 480 mm length, 102 width 88 height
Weight: 5.5 Kg (cell)

Developed in collaboration with
Prof. Juan Fernandez de la Mora at Yale University

Related products

Nanoparticle analysis up to 30 nm Half Mini

Faraday cage electrometer with exceptional noise level and rise time

For product developers: separate DMA cell, i.e., without accessories (ionizer, pump, etc.)

We want to become your strategic R&D partner !!!

SEADM, a research-intensive company, goes far beyond a simple technology provider but has the utmost interest to cooperate with you in your research. Just contact us at:

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* Values for particles with only one elementary charge. The size range naturally is widened in the case of multiply charged particles either when using the DMA alone or in combination with a MS. For example, Hogan et al. have presented high resolution DMA-MS spectra for the multiply charged large protein complex GroEl (mass~800,000 Da; diameter~13 nm), J. Phys. Chem. B, 115 (13), 3614-3621, 2011.