

State of the Art Sample Preparation
for high resolution MALDI MSI

SunCollect Pneumatic Sprayer

Advanced Sample Preparation for MALDI Imaging



MALDI Imaging

MALDI Imaging mass spectrometry enables the visualization of the spatial distribution of proteins, peptides, pharmaceutical compounds and their metabolites, biomarkers or other compounds within thin slices of sample such as human, animal or plant tissue. It is a promising tool for putative biomarker characterization and drug development. Recent work has also demonstrated the capacity to create three-dimensional molecular images using the MALDI Imaging technology and co-registration of these image volumes to other imaging techniques such as magnetic resonance imaging (MRI).

The **sample preparation** is often the **limiting factor** in spatial resolution. Limiting factors include crystal size and homogeneity of the matrix coverage and the undesirable migration/diffusion of analytes.

Finest Tissue Coverage

The SunCollect System uses an optimized spray generator to produce extremely small matrix droplet sizes. It 'atomizes' the matrix solution with its patented spray nozzle using compressed air or nitrogen gas.



Figure 1: SunCollect pneumatic spraying system.

SunCollect enables the user to produce by far the finest matrix crystals worldwide in combination with a very high homogeneity. For α -Cyano-4-hydroxycinnamic acid (HCCA), **crystal sizes around 100 nm** can be achieved (Figure 2).

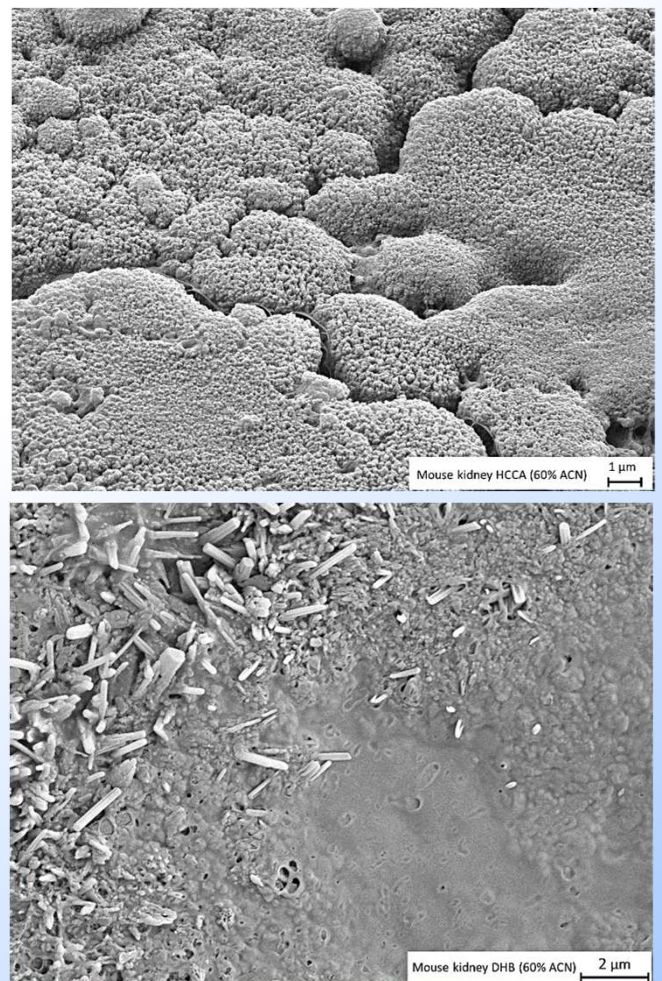


Figure 2: Homogeneous layers of HCCA (top) and DHB (lower) sprayed on mouse kidney samples using SunCollect.

Furthermore, the SunCollect system is extremely fast: To cover a standard ITO glass slide (75 x 25 mm) it takes about 50 seconds per layer. The patented multi-layer-technique allows additionally a very high efficiency for analyte extraction while keeping the spatial resolution (Figure 3).

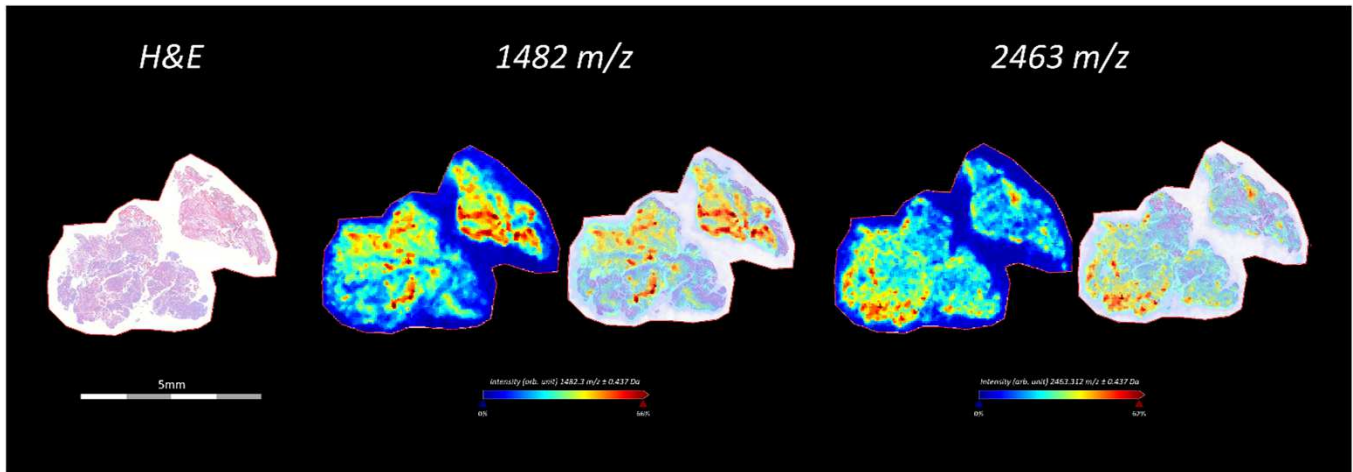


Figure 3: MALDI-MS-Imaging of various peptides from FFPE-tissue sections of human head and neck tumor samples. (Courtesy of F. v. Eggeling; University Hospital Jena, Germany).

High Comfort Dispenser System

SunCollect was initially equipped with an automated syringe pump for matrix delivery. It allows highest precision even at very low flow rates, necessary for MALDI Spotting and in connection with a Nano-HPLC. However, for MALDI Imaging applications, we developed a great new dispenser system that offers significantly more comfort (Figure 4).

The dispenser system is equipped with a PEEK valve that has six inlet ports. It enables the user to spray enzyme and matrix solution directly one after another without any need for manual removal of

solutions from liquid pathways. The system is self-cleaning and fully software controlled. The new software is self-explaining and intuitive and enables even higher quality spraying results. For that reason, the spray direction can be rotated 90° every second layer. Furthermore, the software controls the refill of the dispenser syringe during the coating process. Automated compression between dispenser and spray nozzle guarantees a constant flow rate and leads to a highly homogeneous coating.

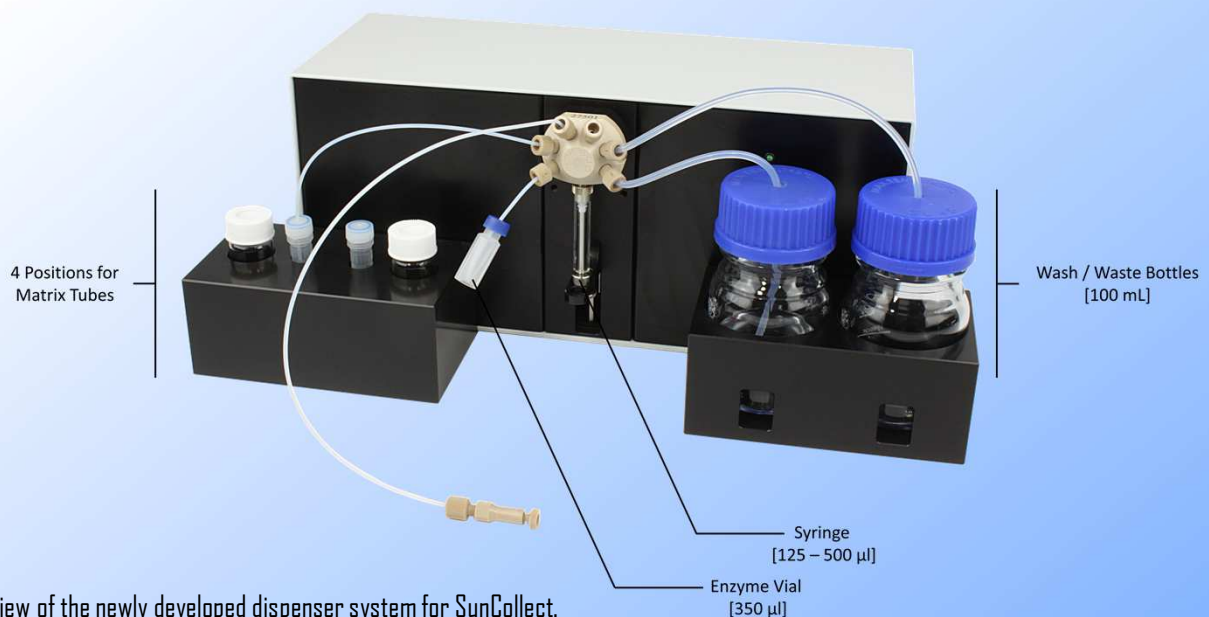


Figure 4: Overview of the newly developed dispenser system for SunCollect.



Technical Specifications

SunCollect Pneumatic Sprayer

Dimensions	<p><u>Closed lid:</u> W 36 cm (14.2") x D 49 cm (19.3") x H 40 cm (15.7")</p> <p><u>Open lid:</u> W 36 cm (14.2") x D 64 cm (25.2") x H 85 cm (33.5")</p>
Weight	17 kg (37.5 lbs)
Power requirements	100 – 240 VAC 50/60 Hz (external power supply)
Number / dimension of sample slides	Max. 8 standard glass slides of 25 x 75 mm or 2 MALDI Targets of max. 82 x 124 mm
Resolution of the axis movement	X - Axis 0.03 mm Y - Axis: 0.125 mm Z - Axis: 0.04 mm
Spray speed	Minimum: 47 mm/min. Maximum: 2250 mm/min.
Flowrates	Minimum: 1 µL/min. Maximum: 20 mL/min. (depending on syringe size)
Adjustable distance from sprayhead to standard target holder	Fine adjustment possible in single millimeter steps: Minimum: 0 mm Maximum: 49 mm
Achievable crystal size by patented spray procedure	- 100-150 nm for HCCA - 1-2 µm for DHB
Instrument control	Windows laptop or tablet PC
100% Biocompatibility	All wetted parts are made of quartz glass, HDPE, PEEK, aluminium ceramic, Tefzel or PTFE
Option to convert the instrument to a MALDI spotter and nano/micro-LC fraction collector for bottom up proteomics	Spot / fraction size down to 1 nL (nano liter) possible

For research use only. Not for use in diagnostic procedures.

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