Incorporation of a dual ESI/MALDI source with a high resolution quadrupole-orthogonal time-of-flight (Q-OTOF) mass spectrometer for MS imaging applications

EMSL

at Pacific Northwest National Laboratory

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Overview

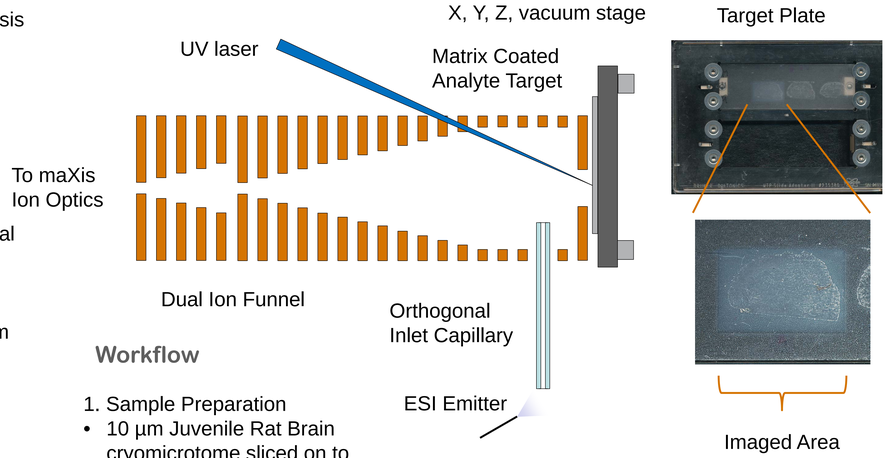
- Incorporation of dual ESI/MALDI source on a Bruker maXis Q-OTOF platform
- Develop control system and data analysis workflow
- Demonstrate MS imaging capabilities

Introduction

- Dual ESI/MALDI source has operational flexibility enabling a wide range of applications, including MS imaging [1]
- Bruker maXis selected as base platform due to high resolution, sensitivity, and acquisition speed of this Q-TOF spectrometer [2]
- Modified dual ion funnel source [3] incorporated an orthogonal ESI capillary and an on axis MALDI stage
- Bruker Smartbeam II provided a solid state Q-switched 1 kHz repetition rate Nd:YAG laser for the MALDI source
- MALDI stage and laser control was implemented based on Bruker MTP II electronics and PC based serial communication
- Data analysis incorporated PRISM tools and workflow [4]

Methods

Dual ESI/ MALDI Source



Workflow

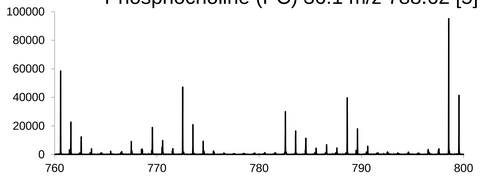
1. Sample Preparation
   - 10 µm Juvenile Rat Brain cryomicrotome sliced on to ITO slides
   - Matrix coating was 20 mg/mL 2,5-DHB in 1:1 water: methanol with 0.2% TFA using 100 Bruker ImagePrep coats
2. Data Acquisition
   - MALDI image data acquired by moving the stage 275 µm/s with laser firing at 1 kHz
   - Each image line was acquired as a separate "LCMS" dataset
3. Spectrum Preprocessing
   - DeconTools [4] performed peak picking and deisotoping of high resolution data
   - Exported MALDI spectra features
4. Data Analysis
   - MALDI features were concatenating into an array calculating *x* and *y* positions for each spectra
   - Images for specific features were selected based on *m/z*

Results

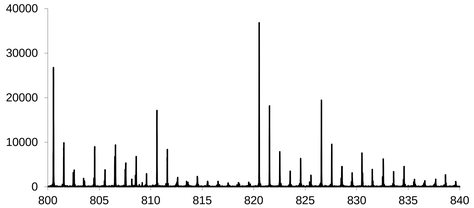
MALDI MS Spectra

MALDI Images

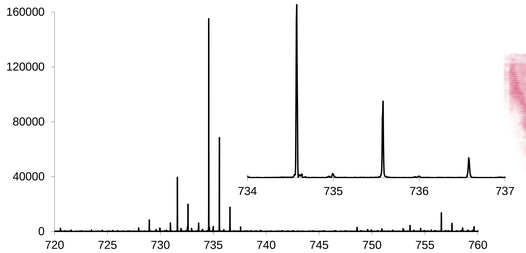
Phosphocholine (PC) 36:1 m/z 788.62 [5]



PC 36:4 + K *m/z* 820.53



PC 32:0 *m/z* 734.57



Conclusions

- MS imaging capability was demonstrated
- Future Incorporation of Ion Mobility Spectrometry
- Continued development of MS imaging control and data analysis

Acknowledgements

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