

Ambient Aerodynamic Ionization Source for Remote Analyte Sampling and Mass Spectrometric Analysis

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INTRODUCTION

In the last few years many ambient ionization sources have been developed.

Aerodynamic devices have also been used to make new ambient ionization source.

Most of them deal with samples near the mass spectrometer's inlet.

When considering multiple ionization sources like MALDESI performance can be less than optimal.

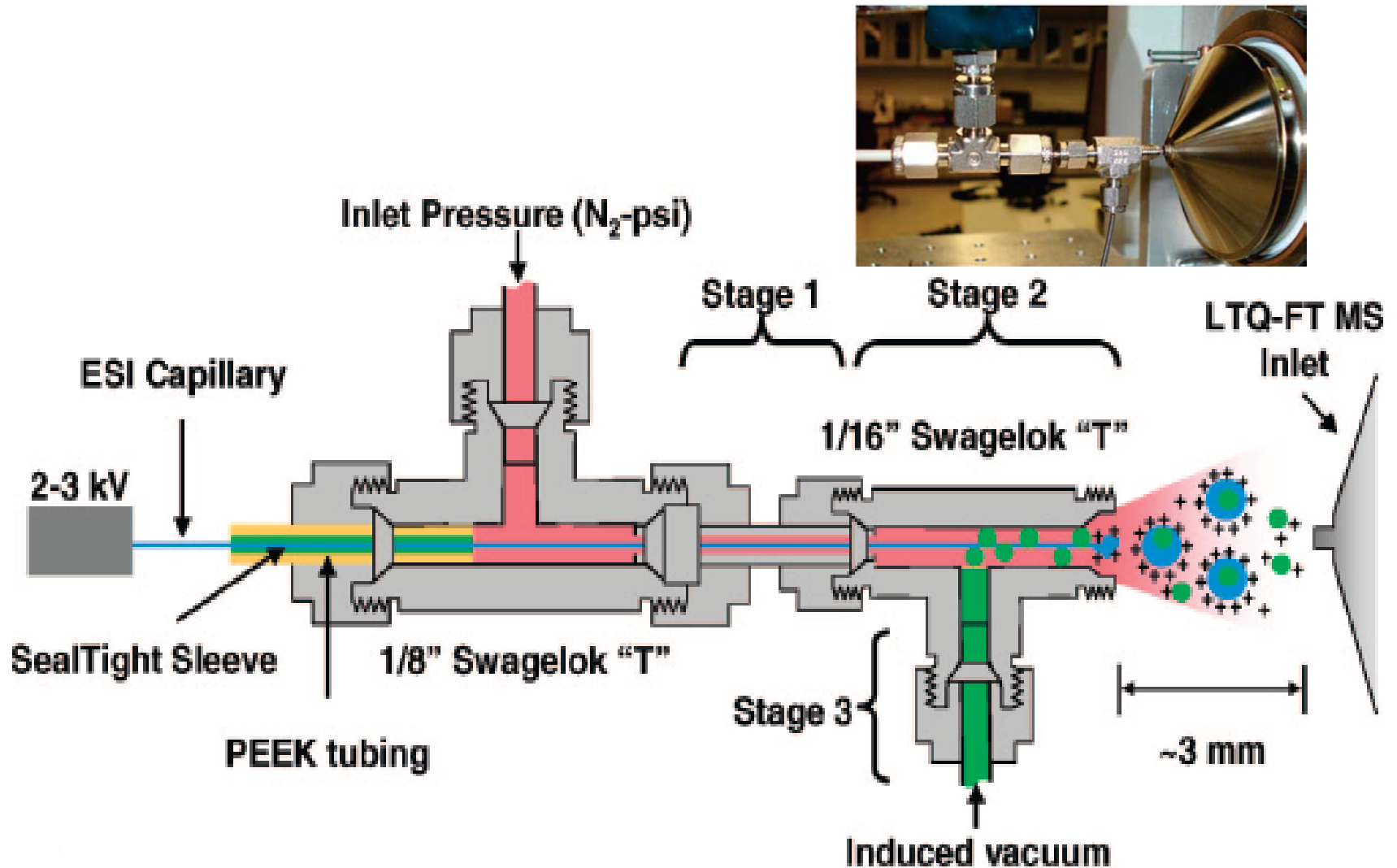
Post transport ionization have been described by FD-ESI and EESI where volatile or semivolatile neutrals have been used.

Here a new ionization source have been introduced called remote analyte sampling, transport, and ionization relay (RASTIR).

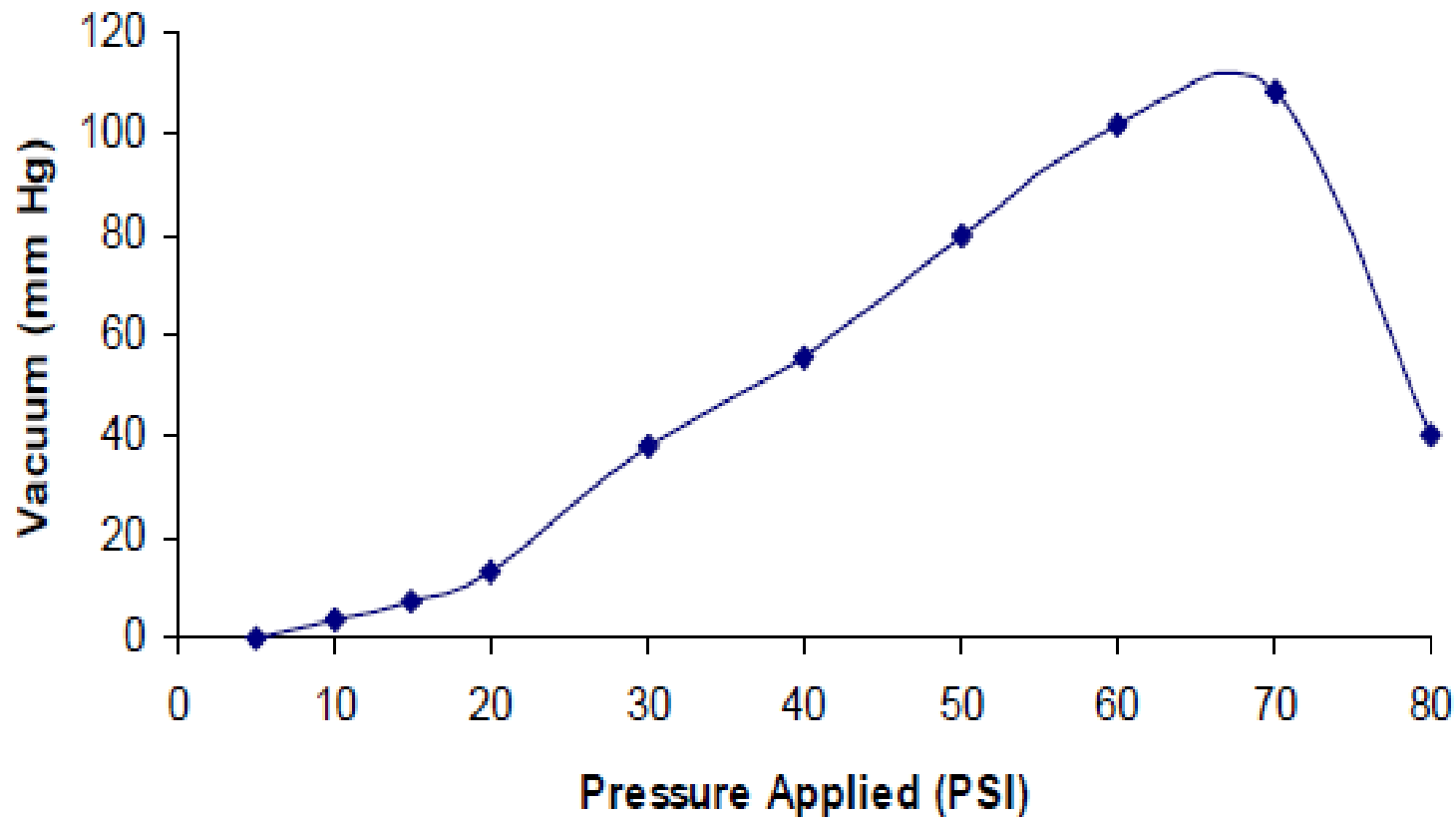
Two kinds of experiments have been performed with this source:

1. Remote (~ 1 ft) vacuum collection of pure sample particulates from a glass slide, entrainment and ionization at the ESI emitter, and mass spectrometric detection.
2. Capture (vacuum collection) of matrix-assisted laser desorbed proteins followed by entrainment in the ESI emitter plume, multiple charging, and mass spectrometric detection.

SCHEMATIC REPRESENTATION OF THE RASTIR SOURCE

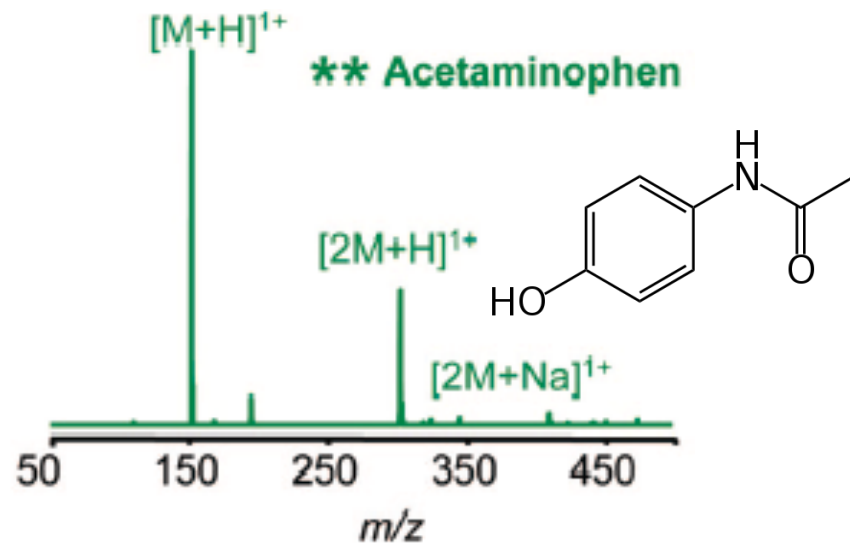
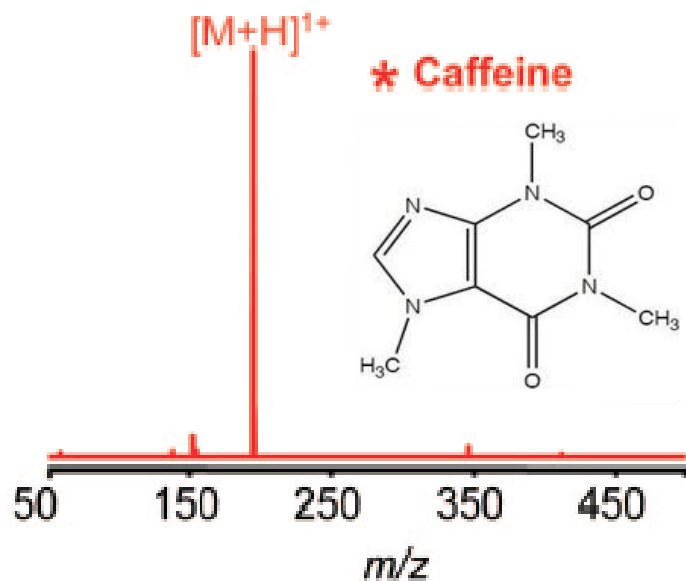
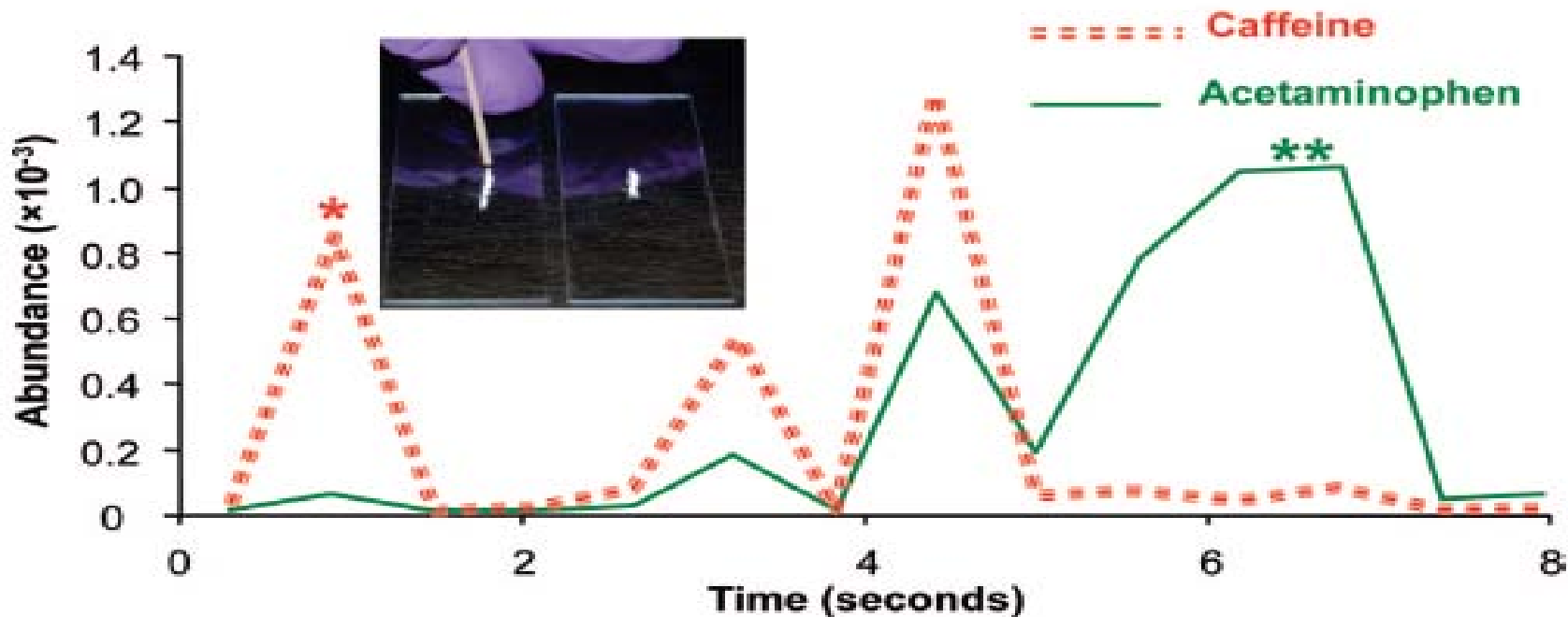


PERFORMANCE OF THE RASTIR SOURCE

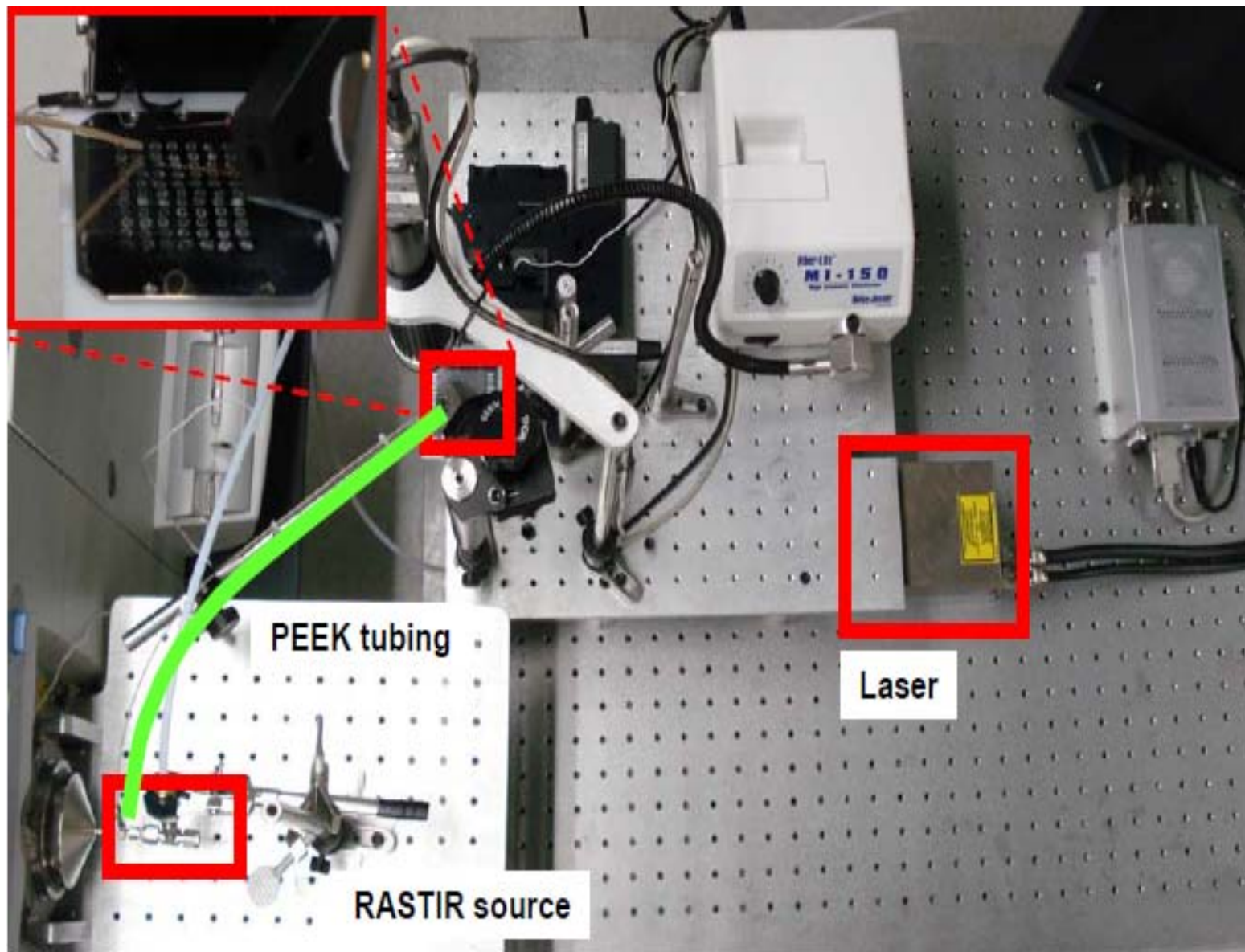


Pressure Applied (PSI)	Vacuum (mm Hg)
5	0
10	4
15	7
20	13
30	38
40	56
50	80
60	102
70	108
80	40

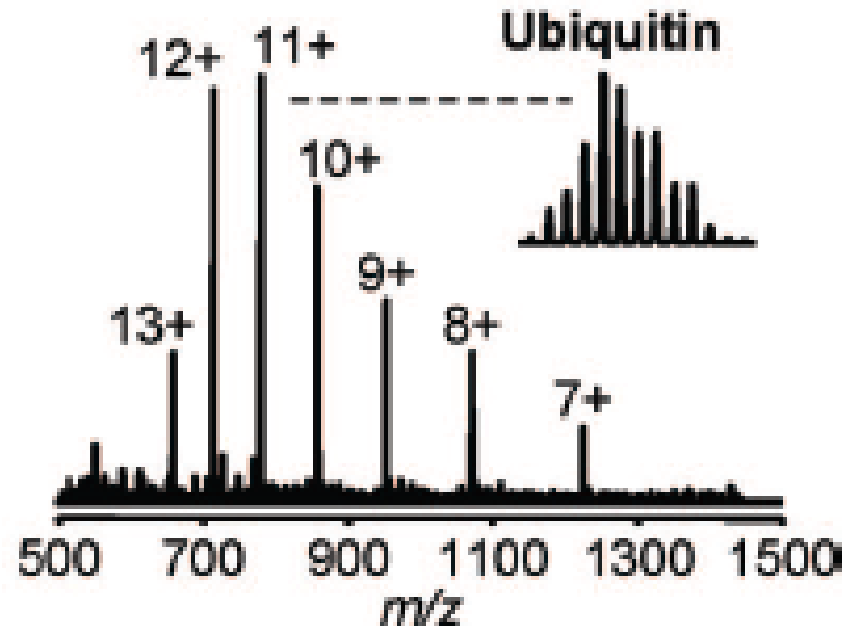
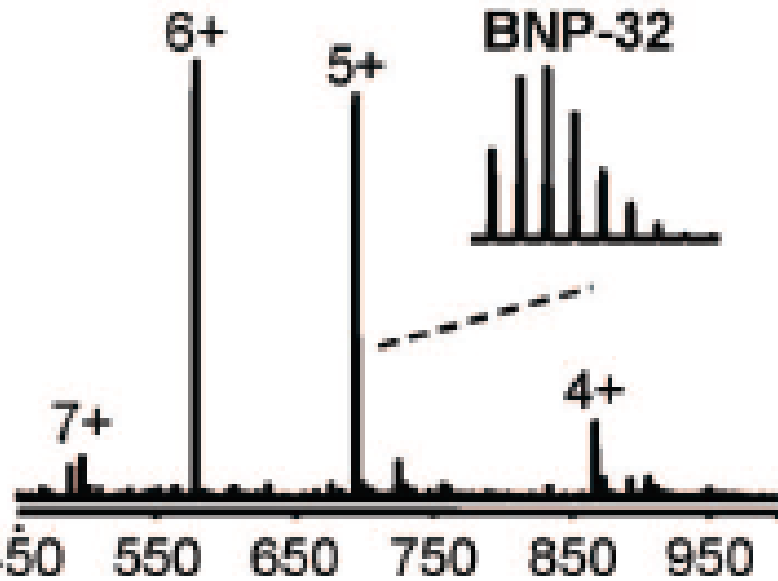
APPLICATION OF RASTIR



EXPERIMENTAL LAYOUT OF MALDESI-RASTIR SOURCE INTERFACED WITH LTQ-FT MS



APPLICATION OF MALDESI-RASTIR



CONCLUSION

A new ambient ionization source (RASTIR) have been described based on fluid dynamics principle which has the capabilities of both remote sampling and post ionization.

Remote sampling of nonvolatile dry powder samples have been done by vacuum collection. Subsequently they were entrained, ionized and detected.

By coupling with MALDESI, matrix-assisted laser desorbed species also have been collected from remote places and after entrainment ionized in ESI plume and detected as multiple charged species.

Two inter-related challenges are there to improve RASTIR performance. The first is to quantitatively define capture efficiency, limits of detection, and ionization efficiency of RASTIR, and the second is transitioning it to a more refined device via mathematical modelling and precision engineering.

FUTURE POSSIBILITIES

Topographical mass spectrometric images of 3D materials may be possible.

Real time monitoring of reactions is possible. Kinetics and mechanisms may be determined.

THANK YOU