

The Improved Teeny-TOF Mass Spectrometer for Chemical and Biological Sensing

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ABSTRACT

A miniature, low voltage, reflectron time-of-flight mass spectrometer has been developed and tested on a series of compounds ranging in mass from a few hundred Da to over 50kDa. The design employs a small and commercially available 10 l/s pump, a 140uJ nitrogen laser, and fiber optics to deliver the laser energy. A gridless, focusing ion source is operating at 4.5kV, the ruggedized reflector is rolled from a flexible circuit board and encased in fiberglass, and the detector has an improved anode that reduces ringing commonly found in coaxial designs. The first prototype is currently being tested for its use in chemical and biological threat detection.

FEATURES

- Gridless, focusing ion source
High extraction field. Efficient transfer of ions into reflector.
- Fiber optic delivery of MALDI laser energy
- Rolled flexible circuit ion reflector
Integrated resistor network. Rugged and inexpensive.
- Improved coaxial MCP detector assembly
Micro-node anode reduces noise and ringing
- Miniature vacuum system
Pfeiffer 10 l/s turbo-drag pump, small KnF diaphragm pump

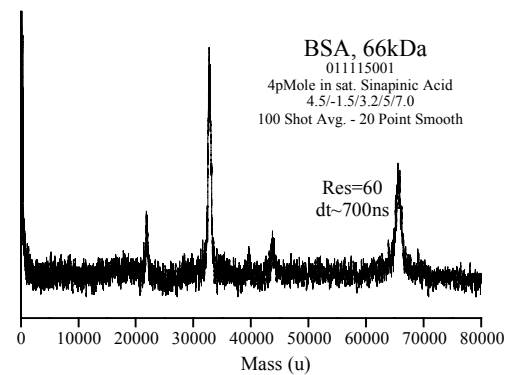
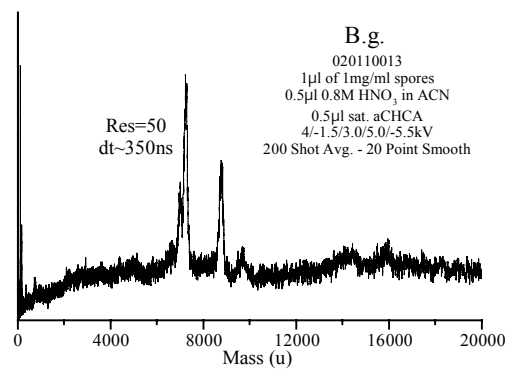
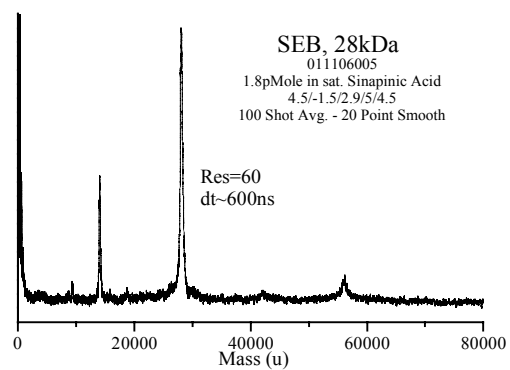
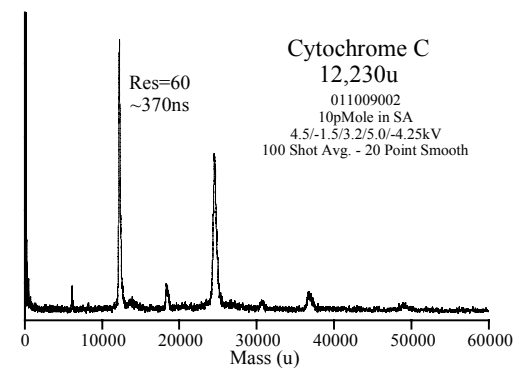
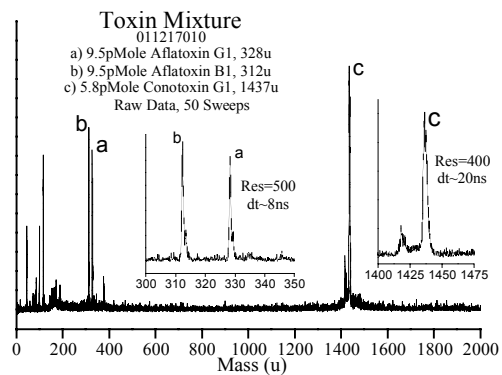
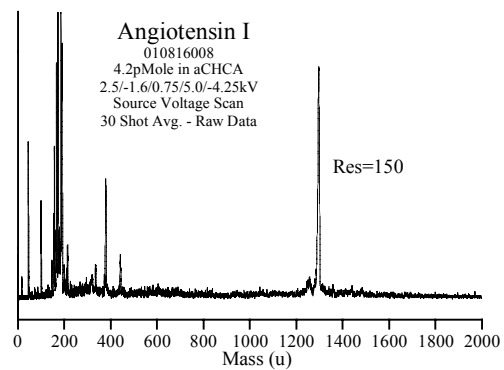
DISCUSSION

The bench-top configuration of this instrument is currently being tested on a wide range of compounds for its use in detecting chemical and biological threats. With a fixed set of static analyzer voltages, we have detected compounds ranging in mass from a few hundred Da to over 60kDa.

Test compounds are mixed with a matrix solution to a final concentration of 1 to 10 pMole/ml and 1 ml of the resulting solution is deposited onto a sample probe and dried. The matrices used for these experiments are saturated Sinapinic Acid (SA) and saturated α -Cyano-4-hydroxycinnamic Acid (α CHCA) in H₂O:ACN:TFA (70:30:0.2v)

In addition to the field portable application of this single analyzer instrument to chemical and biological agent detection, the modular component approach we have taken allow us to bundle multiple analyzers into a single instrument for rapid parallel data collection. Preliminary tests on a 4 analyzer instrument look very promising.

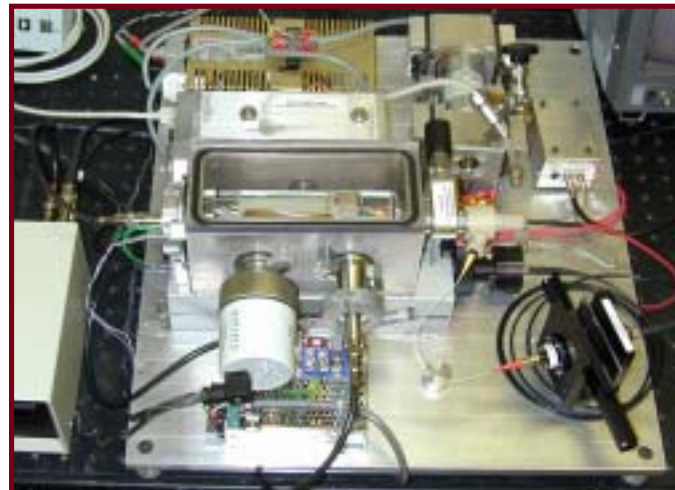
TYPICAL SPECTRA



PHOTOGRAPHS



**Time-of-Flight Mass Analyzer
Reflectron, Detector, Vacuum Flange**



**Time-of-Flight Mass Spec. System
Bench Version Currently Under Test**



**Time-of-Flight Mass Spec. System
Suitcase Configuration**

Acknowledgements

We would like to thank the following people for their assistance and advice:

Skip Collins and Doug Lewis (JHU APL) for their help during instrument development.

Jude Height and Kelby Yoon (ECBC, Aberdeen Proving Ground) for their facilities and help in testing this instrument.