

# Micro Ion Traps: Emerging Explosives Detection Technology

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## Description

Sandia National Laboratories is advancing microsystem technology that could have a “game-changing” impact on trace explosives detection.

Micro-planar ion traps are the core technology that would enable a new generation of hand-held mass spectrometers. Sandia's micro-planar ion traps are designed to provide the functionality of macro-scale (centimeter) Quadrupole or Linear Paul ion traps. The new approach allows precise arrays of micro-scaled traps to be fabricated on a single chip.

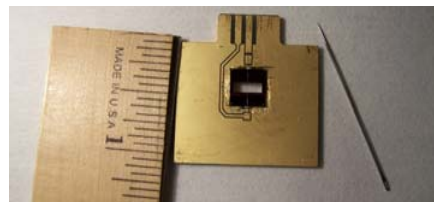
## Benefits

This work provides the following benefits:

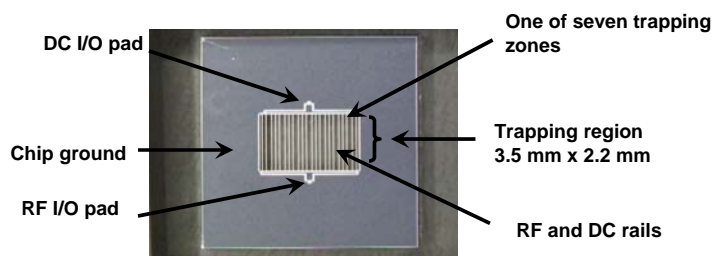
- Better specificity (identifying the chemical composition) through the use of mass spectrometry vs. ion mobility spectrometry (IMS)
- Require less electrical power than benchtop spectrometers
- Smaller vacuum volume with moderate vacuum requirements than benchtop spectrometers

### Three views of the ion trap:

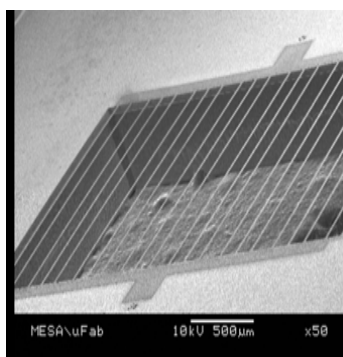
#### a) trap chip on a card edge carrier



#### b) The trap chip



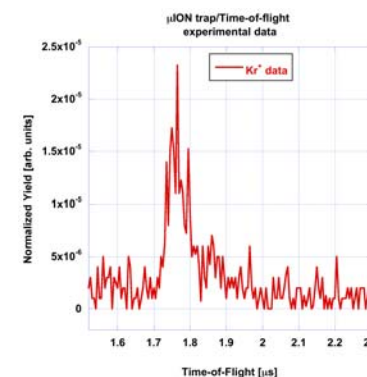
#### c) scanning electron micrograph (SEM) image of the trapping region



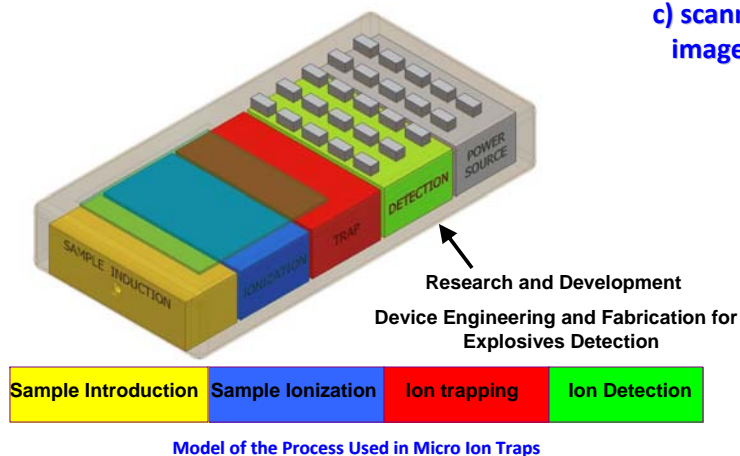
## Materials Successfully Trapped

The following materials have been identified with micro ion traps:

- Krypton/Xenon
- Nitrogen
- Nitromethane/Ammonium Nitrate/Methanol

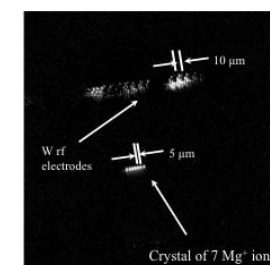


Data graph of the capture of Krypton/Xenon gas. Demonstration of the trapping of krypton using the PMASS chip. Data collected by trapping the Kr<sup>+</sup> ions, holding the Kr<sup>+</sup> ions for 100 micro seconds, then extracting with mass identification confirmed by time-of-flight analysis.



A mass spectrometer consists of several inter related components, including sample introduction, ionization, mass separation and detection, and data processing. We are currently developing technology for the mass separation component of the system

PMASS ion trap foundry technology has been used in another application, quantum information processing. Shown are trapped and laser cooled magnesium ions in an SNL developed ion trap



Courtesy of NIST Boulder