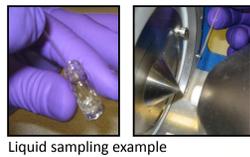


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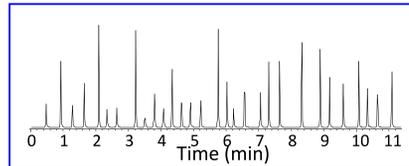
Traditional DART Intro

- Ambient ion source for MS
- Directly from surfaces
- Non-contact
- No/low sample prep
- Picogram sensitivity
- Greatest advantage is speed



Liquid sampling example

Typical analyses rate by hand: 30 samples in 11 min



Development of Vapor Sampling Adapter

Limitations of Traditional DART:

- Fixed source-inlet geometry
- Limits size of sample
- Not portable
- Open

Therefore a custom vapor sampling adaptor (VSA) is developed to couple a heated transfer line (HTL), DART ion source, and mass spectrometer (MS):

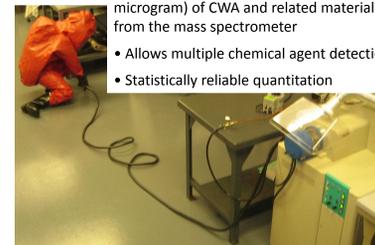
- 1) Using negative pressure transport chemical warfare agent and/or other material vapors over a useful distance
- 2) Rapidly ionize vapor stream with the DART ion source
- 3) Analyze by research grade mass spectrometer



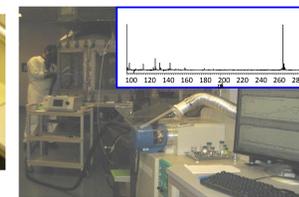
Applications of VSA

Works as Intended:

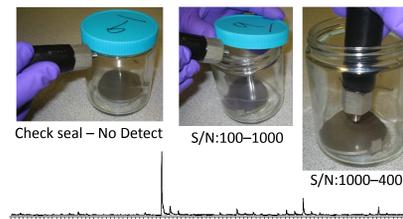
- Overcomes geometric and portability limitations of traditional DART
- Using it, one is able to detect and identify small quantities (less than 1 microgram) of CWA and related materials at distances greater than 15ft from the mass spectrometer
- Allows multiple chemical agent detection and identification
- Statistically reliable quantitation



Dramatization of intended use



In use detecting residual VX from post-exposure chamber



Used to verify decon:

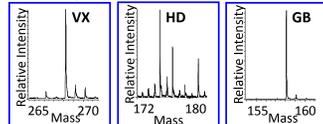
- Low vapor pressure compounds like VX and EA 2192
- Detects headspace vapor of micro gram quantities
- Higher sensitivity when closer to contamination

Largely Retains Advantages of DART-MS:

- Though the heated line adds transport (~7s) and recovery time (15-30s) to analysis, detection is still very rapid and ongoing ("in Real Time") and eliminates hand sampling and transport
- Though less sensitive than direct, it retains much sensitivity by "sniffing" a small localized area, therefore vapors arrive at the analyzer relatively undiluted by room air
- Capitalizes on the presence of some vapor pressure, though extremely low in some cases, which exists for nearly all compounds
- A method of localized heating such as a flash lamp or simple heat gun at the distant HTL inlet improves sensitivity. This aids the volatilization of the lower volatility materials
- Still no direct contact with contamination

Traditional Applications

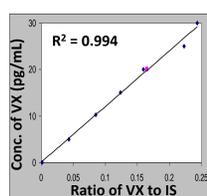
10 ng Agents, Various Surfaces



Direct



Analyzing decon process coupon



Wipe Analysis



- Quantitative
- Using Internal Standard



Heated Transfer Line:

- Transports sample vapors for subsequent ionization
- Line morphology, coating and temperature can be optimized for target compound(s)
- Length as necessary to bring sample vapors to fixed position of MS
- Flexible to reach awkward locations

Mass Spectrometer:

- Wide variety of compatible MS
- Select MS based on application needs and availability
- HTL moves so MS can remain in fixed position



Compatible mass spectrometers

Agilent 6890N
Agilent 6890A
Agilent 6890B
Agilent 6890C
Agilent 6890D
Agilent 6890E
Agilent 6890F
Agilent 6890G
Agilent 6890H
Agilent 6890I
Agilent 6890J
Agilent 6890K
Agilent 6890L
Agilent 6890M
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Agilent 6890O
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Agilent 6890CF
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