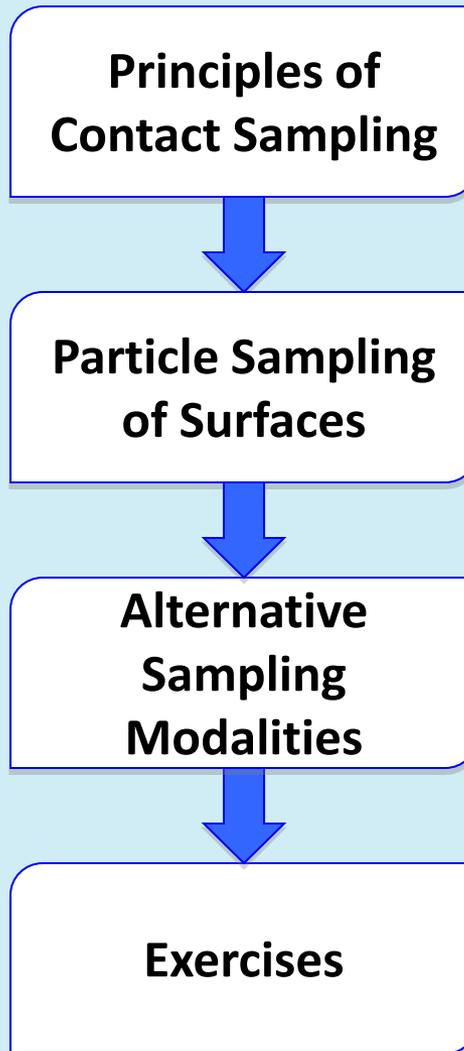




Technology Transition Workshop | *José R. Almirall, Ph.D.*

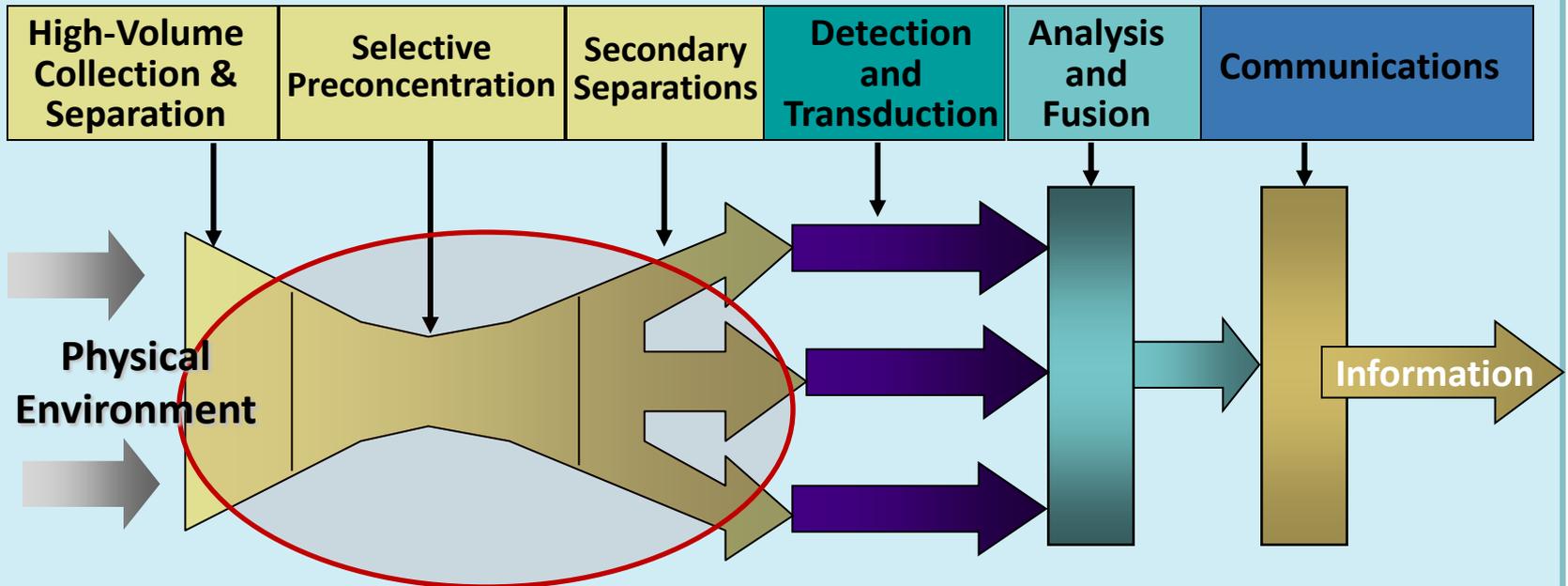
Use of PSPME for Particle Sampling of Surfaces for Drugs and Explosives

Outline



Improving Detection with Better Collection

- Technical Approach—improve the “front end” of collection and sampling
 - Benefits:
 - Enhanced sensitivity and selectivity
 - Applicable to many systems



- Existing collection materials
- Polymers for air and waters
- Metal grids for air
- Muslin cloth for surfaces

Image courtesy of the
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- **Physical structure for enhanced collection**
 - Optimize for collection, durability, and release
 - Quantitative work with particle collection
 - Mechanical action and removal/collection

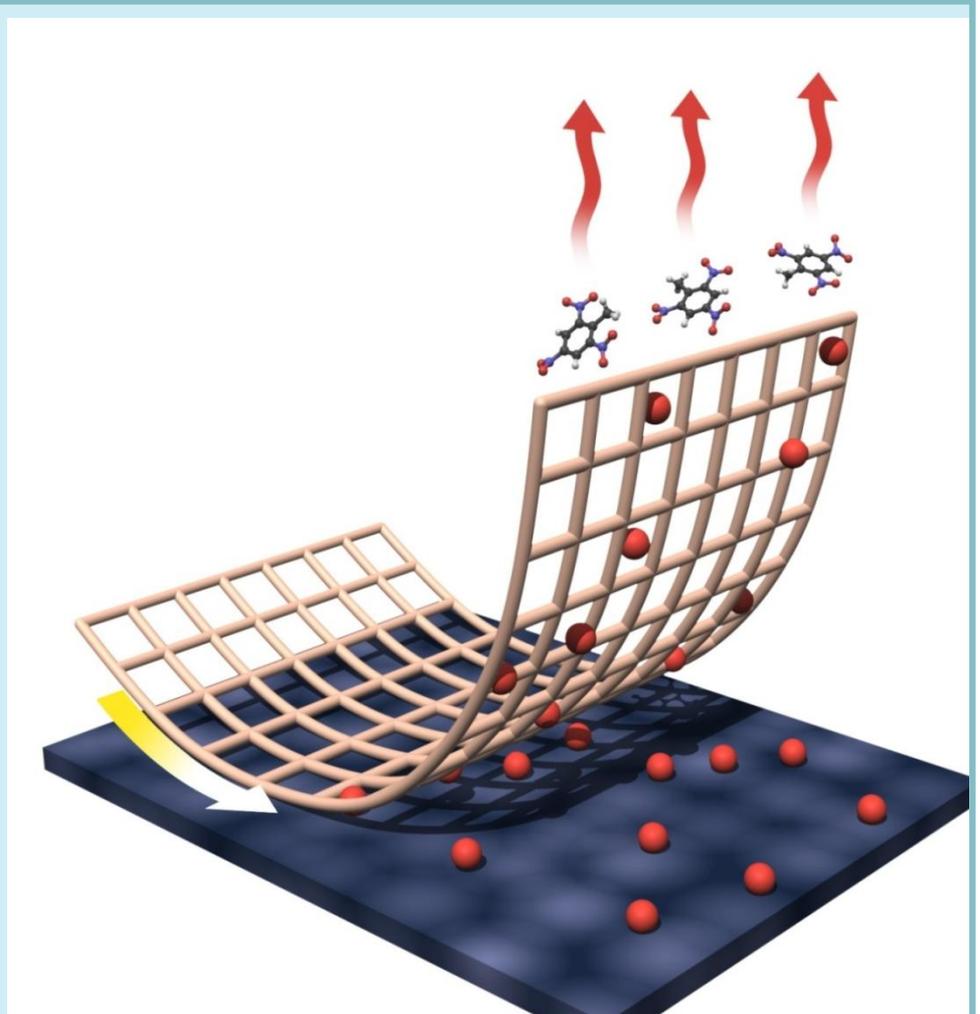
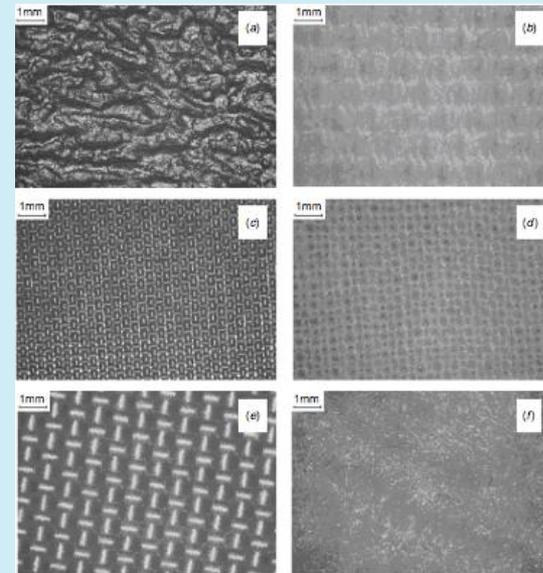


Image courtesy of the Pacific Northwest National Laboratory

Particle Sampling- Surface Wipe

- **Conforms to surfaces**
- **Low cost sample collection**
- **Direct introduction to instrument via thermal desorption**
- **Wipe material more significant than applied pressure for removal**



Verkouteren et al. (2008)

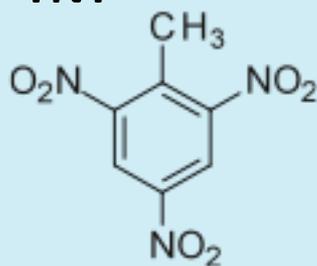
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Standard Reference Material 2905

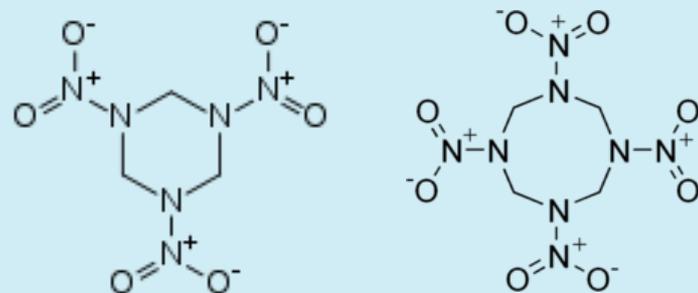
- Provides trace levels of the plastic explosive C4 (RDX and HMX) and the military explosive TNT at nominal mass fractions of 0.1 % and 0.01 %

TNT



http://www.aiexplosives.com/inspections_articles.asp?id=21

RDX and HMX



Composition C4 blocks



[http://en.wikipedia.org/wiki/C-4_\(explosive\)](http://en.wikipedia.org/wiki/C-4_(explosive))

Standard Reference Material 2905 (Continued)

- **Purpose: evaluate performance of trace explosive detectors**
 - Calibration
 - Testing
 - Detection
 - Collection efficiency
 - Helps in making purchasing decisions
 - **Development of standard operating procedures**



http://www.smithsdetection-sci.com/images/ionscan_400B_rdx_100x100.jpg

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Visualization of SRM 2905



<http://www.fosterfreeman.com>



<http://www.fosterfreeman.com>

Blue (420 – 470 nm)

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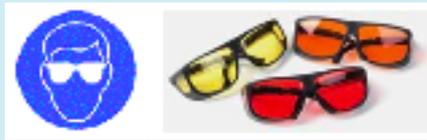


Visualization of SRM 2905 (Continued)



<http://www.fosterfreeman.com>

Blue (420 – 470 nm)

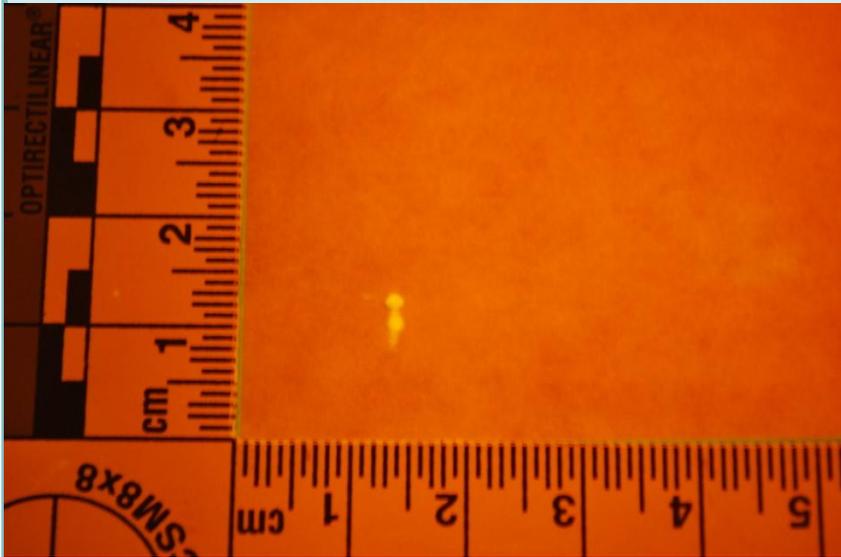


<http://www.fosterfreeman.com>

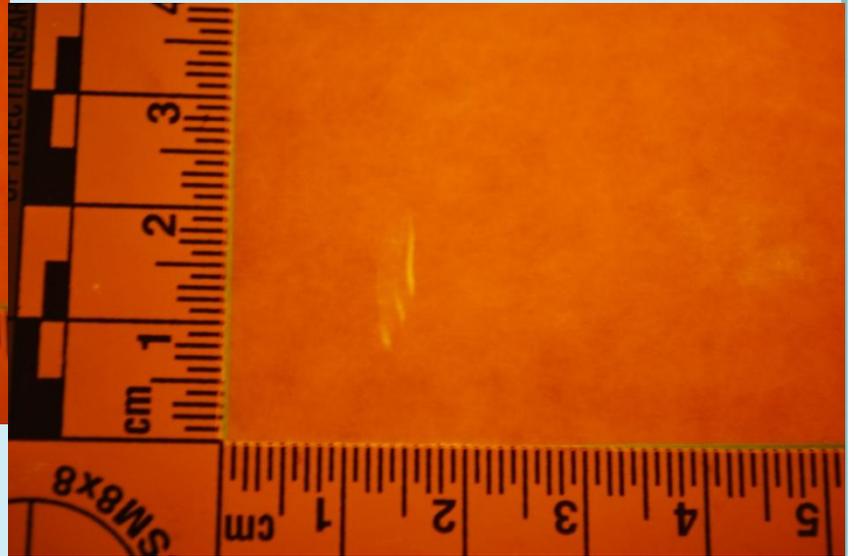
Orange



Wipe Sampling of SRM 2905



Before



After

Standard Reference Material 2905

- **Fluorescently tagged**
- **Helps in the evaluation of contact and non-contact particle collection efficiency**
- **How do we know the screener is using an effective method of wiping?**

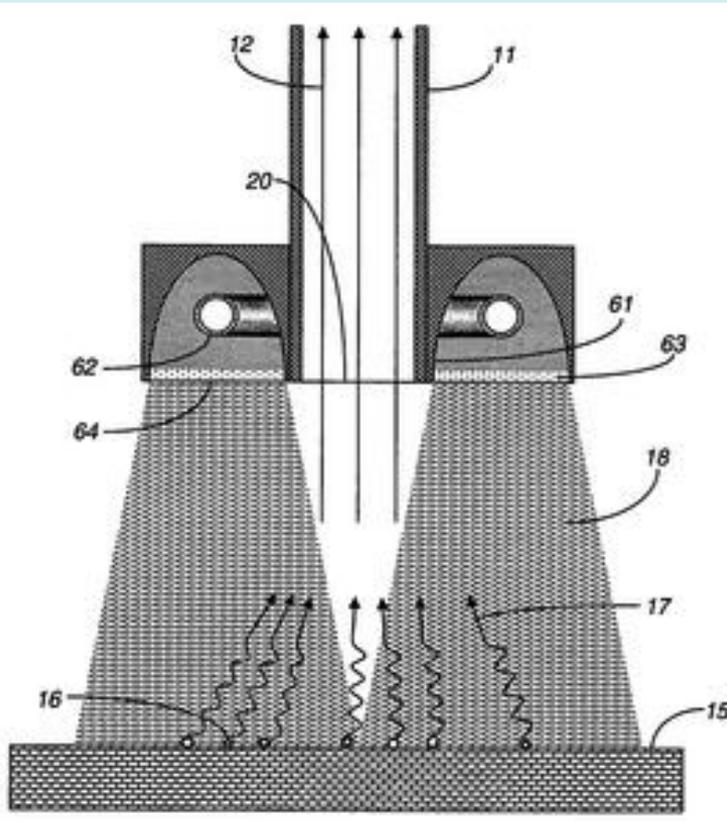


<http://www.tsa.gov/approach/tech/etd.shtm>



<http://www.nist.gov/mml/analytical/organic/traceexplosives.cfm>

Non-Contact Particle Sampling Alternatives



<http://www.freepatentsonline.com/7098672-0-large.jpg>

- Particles are collected by a vortex (mini tornado)
- Ionized
- Detected by IMS

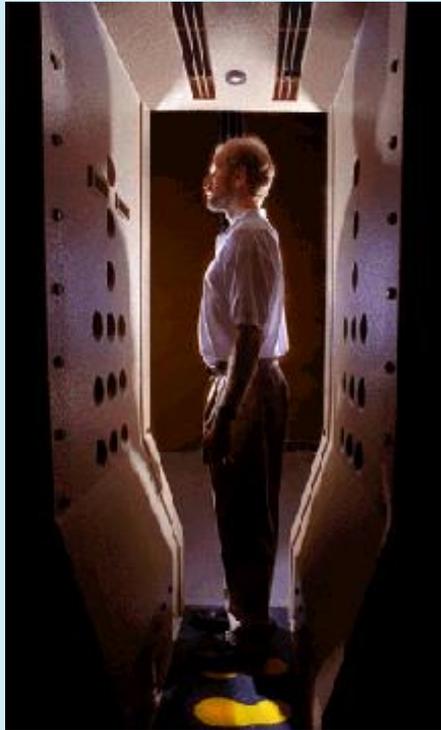


http://implantosciences.com/gfx/qsh150_new.png

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Non-Contact Particle Sampling Alternatives (Continued)



<http://www.youtube.com/watch?v=G2WD-vbKRfM>

- Puffs of air dislodge particles trapped on hair, the body, clothing and shoes
- Particles directed into the SENTINEL II for analysis with help from gravity and a downward airflow

Application of Materials to Enhanced Detection

SPME GC Forensics IMS Portal Monitoring Sensors

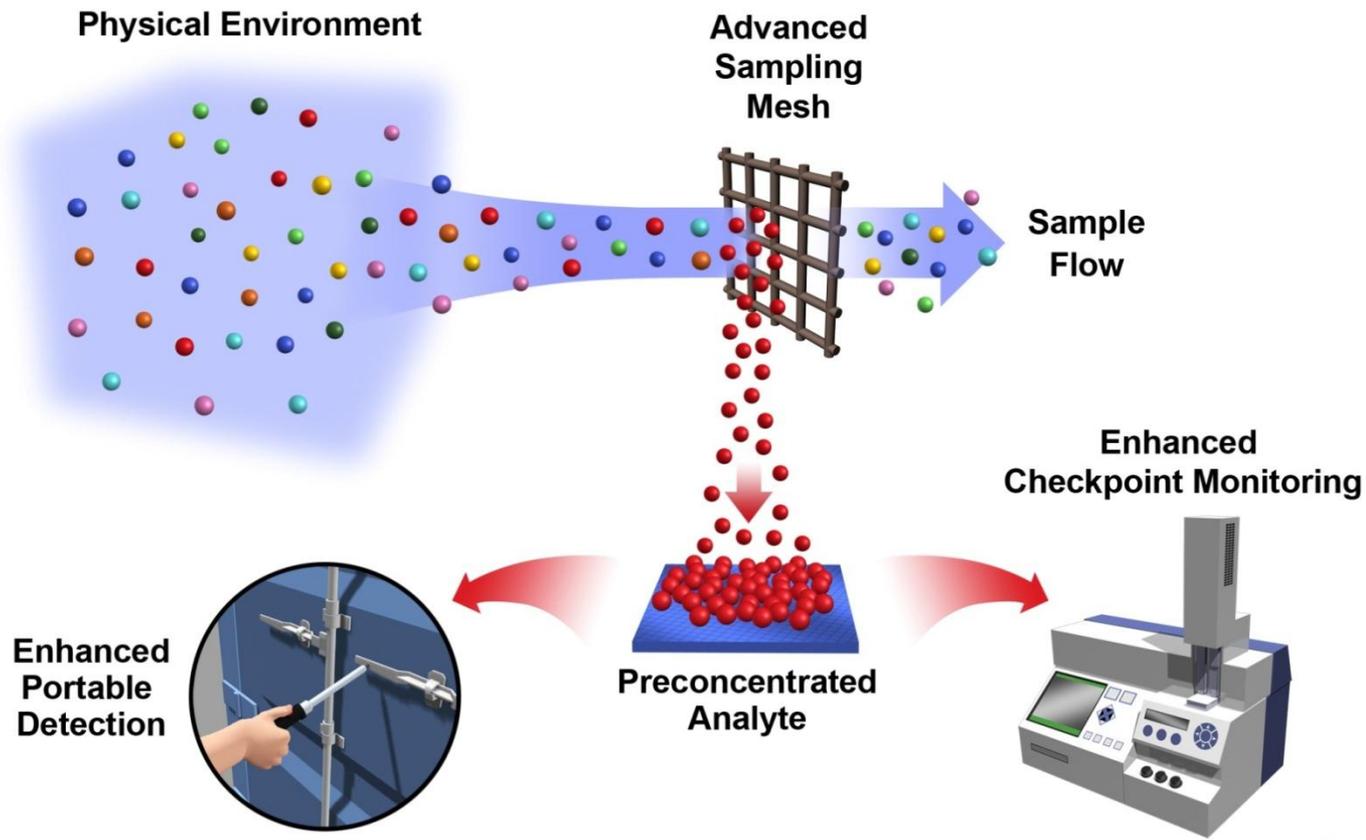


Image courtesy of the Pacific Northwest National Laboratory

Shane.4



Conclusions

- **Particle sampling exercise**
 - Particle sampling (steering wheel, door handle, gear shift)
 - See the handout for instructions

- **Particle sampling advantages**
 - Low Cost
 - Easy to use and fast
 - Designed for existing IMS systems
 - Indicative of relatively recent contact with material

Cited Scientific Reference

- Verkouteren, J.R.; Coleman, J.L.; Fletcher, R.A.; Smith, W.J.; Klouda, G.A.; Gillen, G. A Method to Determine Collection Efficiency of Particles by Swipe Sampling. *Measurement Science and Technology* 2008, 19, 115101. http://iopscience.iop.org/0957-0233/19/11/115101/pdf/0957-0233_19_11_115101.pdf (accessed August 25, 2011)

Questions?

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Contact Information

Professor José R. Almirall, Ph.D.

Department of Chemistry and Biochemistry

International Forensic Research Institute

Florida International University

11200 SW 8th Street, OE116

Miami, FL USA

305348.3917

almirall@fiu.edu



Note: All images and graphics are courtesy of the Dr. José R. Almirall Laboratory unless otherwise indicated.

