

PenDoc 'On the Spot' Sampling, Chemical Analysis, and Diagnostics

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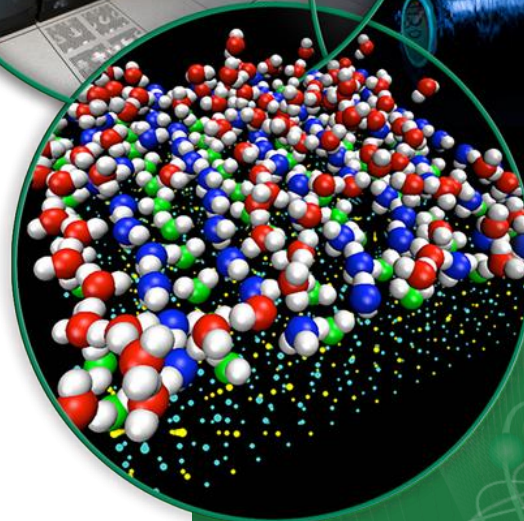
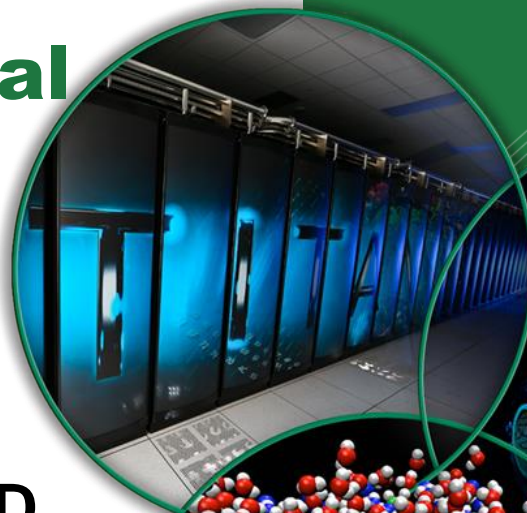
Scientist, Inventor, Problem Solver

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Unmet Need for 'On the Spot' Chemical Analysis



Drug research



Operating room



Clinics



Biomarkers, disease markers, drugs

PenDoc:
An enabling technology
with applications in several
multibillion dollar markets

Pesticides,
toxins



Food safety
and environment

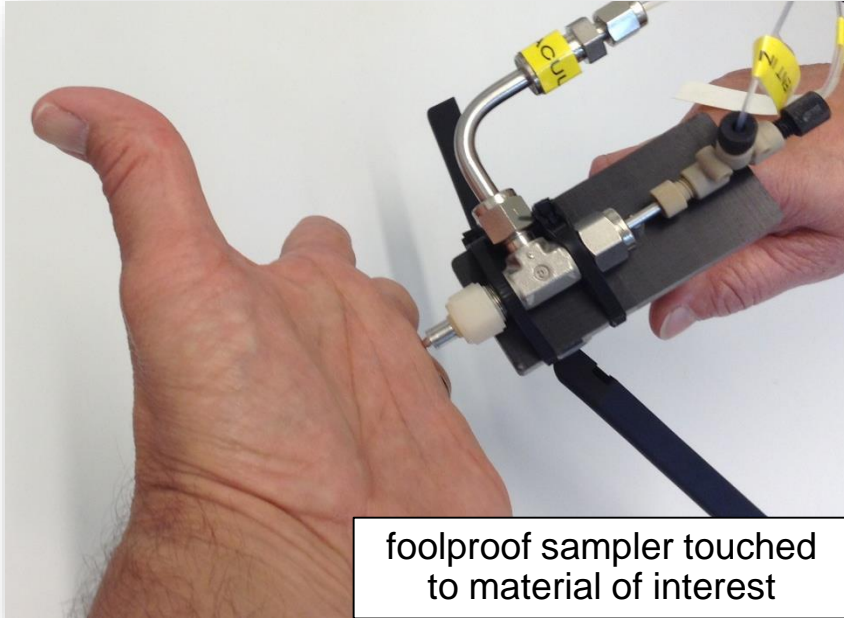
Explosives,
contraband



National security
and forensics

PenDoc Technology Description

Liquid Extraction-Based
'Pen' Sampler



direct connection to
ionization source of
commercial mass
spectrometer

Chemical
Detector

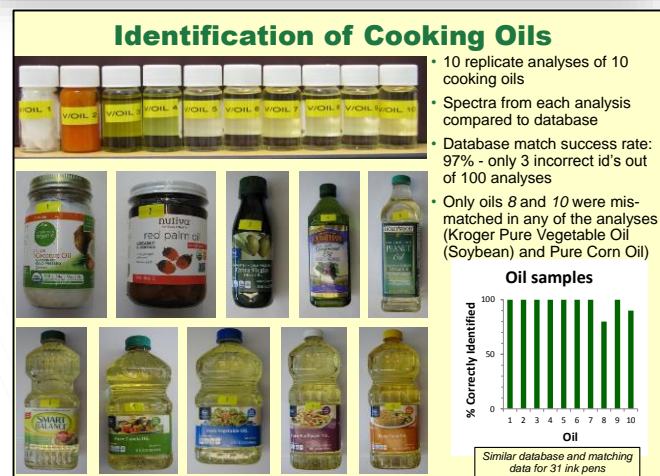
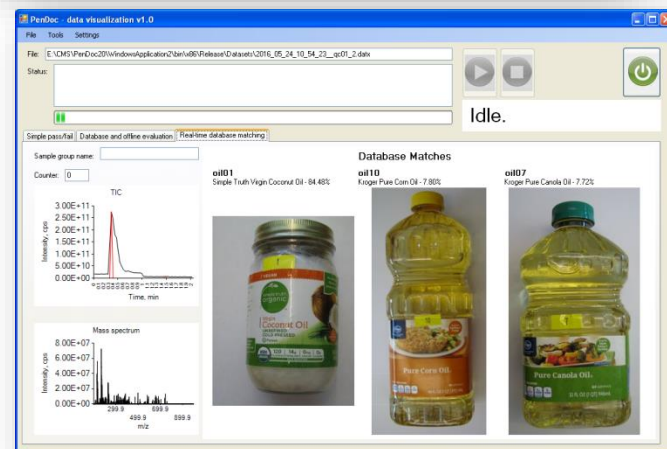


*Sampling probes and software are
patent and copyright protected*
















non-expert user instrument
control and near real time
data analysis and reporting

Present R&D

- Invention, Optimization and Ruggedization of “Pen” Sampling Probes
- Development of Instrument Agnostic, Open Access, Real-time Data Analysis Software
- Assembly of a PenDoc System for ORNL-based or site-deployed beta tests
- Acquisition and Distribution of Demonstration Data: peer-reviewed publications, fact sheets, presentations, YouTube videos, etc.



The PenDoc Proposition - Competitive Differentiation within Mass Spectrometry

Technology Feature	ORNL PenDoc	DESI	DART	ASAP	i-Knife
Ease-of-Use					
Low Cost					
Real-Time Analysis					
Wide Compound Coverage					
Sensitivity for Compounds Analyzed					
Coupling to a Consecutive Separation Step					
Easy-to-Implement on Multiple Mass Spectrometry Platforms					

No current technology that offers similar simplicity of use, detection metrics and versatility for laboratory-based, “on the spot”, or “point of care” real time chemical analysis and diagnostics

Applications – Targeted End Users – Current Practice

Customer Applications	Application Description	Target End Users	Current Practice
Food Safety	Detecting Pesticides/Toxins in Food	FDA, Dept. of Agriculture, CRLs	Field sampling and lab analysis
Homeland Security	Explosives/Contraband Detection	DHS, FBI, DoD, Border Patrol, Law Enforcement, CRLs	Time-intensive, non-continuous sampling Low sensitivity/detection specificity Vapor concentration prior to analysis (PSI-Probe™ by FLIR Systems and M908 by 908 Devices, Inc.)
Clinical Diagnostics	Drug Dose/Use Screening	Hospitals, Clinics, Law Enforcement, Pharma/Biotech, CRLs	Sample and subsequent lab analysis

Partnering/Business Opportunity

- Perfect current sampling probe designs and software operation and invent/create next generation systems
- Identify and target the technology for specific market applications and growth areas:
 - The current *mass spectrometry market* for rapid detection is expected to reach \$19B globally by 2020, with a CAGR of 7.2%. This *growth is driven by a demand for handheld, portable and deployable instruments.*¹
 - The global food safety testing market is projected to reach \$15M in the US by 2018 at a CAGR of about 7%.²
 - Security and explosive detections is also a growing market with the explosive and narcotics trace detection (ETD) market estimated as \$830M in 2013 with an CAGR of 14% from 2015-2020.³
- Transfer the technology to the commercial sector
 - Interest from makers of ‘plug and play’ add-ons for mass spectrometers and small, portable mass spectrometers

¹ “Spectrometry Market Expected to Reach USD 19.6 B Globally in 2020,” August 18, 2014, Transparency Market Research.

² “Food Safety Testing Market by Contaminants, Technology, Food Types and Geography – Global Trends Forecast to 2018,” July 8, 2013.

³ “Explosives & Narcotics Trace Detection; Technologies and Global Market- 2015-2020,” June 23, 2015.

Beta-Test System in Lab Today



Visit ORNL for a demonstration and to learn more