

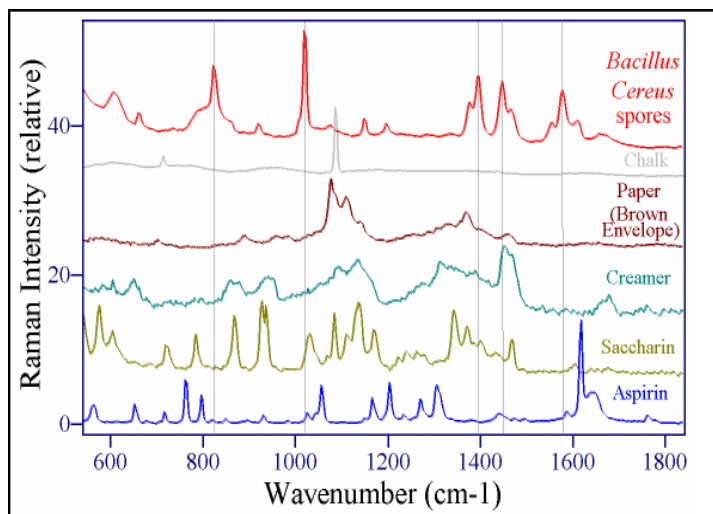
# Hoax Expor (Portable Raman Analyzer)

## RTA Application Note # 07

In the autumn of 2001 bioterrorism became a sobering reality with the distribution of anthrax-causing spores through the U.S. postal system and the subsequent infection and death of several postal and national media employees. Fears grew as spore containing letters were reported from Florida to New York and the extent of distribution remained unknown. The long delay associated with positive identification of the *Bacillus anthracis* spores added to the nation's anxiety. The need for faster detection and identification of anthrax spores became readily apparent. In the ensuing two years, literally thousands of hoaxes, letters containing harmless powders, have been mailed creating additional tension. Thus, in addition to improved methods required to identify anthrax spores, methods are also required to rapidly identify hoax materials.

The **Hoax Expor** measures the Raman spectrum of any material quickly and easily. Every material, including biological spores, has a unique Raman spectral signature that allows its positive identification. The Raman signature of any unknown or suspicious material is matched to one of thousands of signatures stored in memory in less than 1 second. The Hoax Expor is the only portable Raman analyzer that employs 1064 nm laser excitation to **avoid fluorescence interference** and a rugged interferometer that provides 0.1 cm<sup>-1</sup> wavenumber (x-axis) accuracy to guarantee spectral matches.

**Portable Raman Analyzer** with ChemID operating system. Operation involves turning power on, positioning sampling probe and clicking on the "start" button. Identification results are returned within seconds.



**Raman Spectra.** Only biological spores exhibit the "5-band" pattern shown above (x-axis position denoted by gray vertical lines). Common substances are easily discriminated and identified by their own unique Raman band patterns.

### References:

- "Detecting Bacillus cereus spores on a mail sorting system using Raman Spectroscopy"., J Raman Spectroscopy (2003).
- "Differentiating bacterial spores from hoax materials by Raman Spectroscopy"., SPIE, 4575 (2004)

### Real-Time Analyzers, Inc.

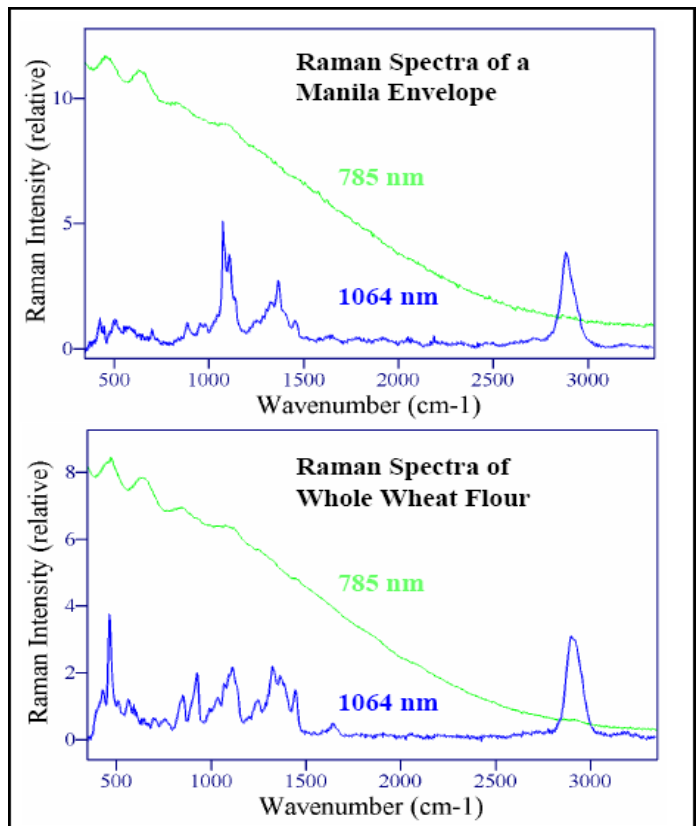
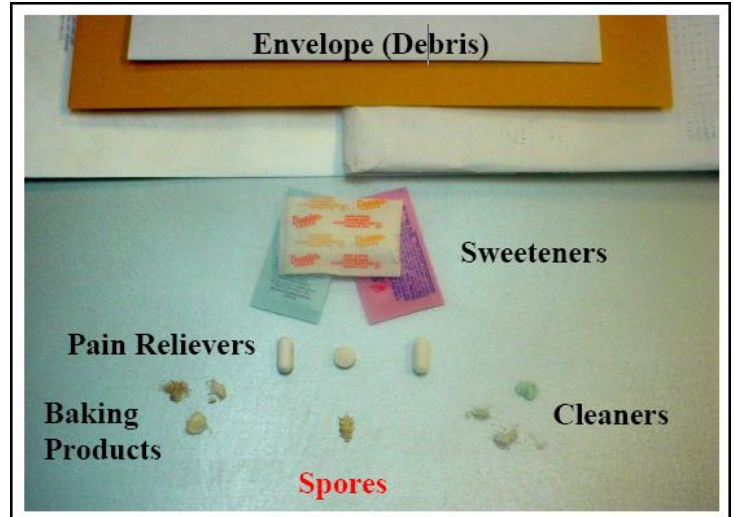
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As illustrated below, fluorescence avoidance is critical to obtain quick, reliable results. 1064 nm laser excitation is demonstrated to be much more effective than shorter excitation wavelengths. Excitation at 785 nm and lower wavelengths generates fluorescence in many materials. This obscures the Raman spectrum and the unknown materials can NOT be identified. We measured the Raman spectra of over 30 common materials and 50% fluoresced using 785 nm laser excitation, and 20% of sufficient severity that no Raman spectrum was observed. However, **Raman spectra of all samples were easily obtained using 1064 nm laser excitation.**

Material	Raman Laser Wavelength	
	785 nm	1064 nm
<b>Cleaners</b>		
Household	Fluoresce	N
Detergent	N	N
Soap/Scented	N	N
Antibacterial	N	N
Bath Powder	N	N
Baby Powder	Fluoresce	N
Baking Soda	N	N
Chalk	Fluoresce	N
<b>Cooking Products</b>		
Flour	Fluoresce	N
Whole Wheat Flour	Fluoresce	N
Pancake Mix	Fluoresce	N
Corn Starch	Fluoresce	N
Creamer	Fluoresce	N
Baking Powder	Fluoresce	N
<b>Paper/Paper Debris</b>		
White Envelopes	Fluoresce	N
Manila Envelopes	Fluoresce	N
Fiber Lined Envelopes	Fluoresce	N
Coated Shipping Envelopes	N	N
<b>Powdered Food</b>		
Baby Formula	Fluoresce	N
Baby Cereal	Fluoresce	N
Buttermilk	Fluoresce	N
Onion Powder	Fluoresce	N
Tapioca	Fluoresce	N
<b>Pain Relievers</b>		
Aspirin	N	N
Acetaminophen	N	N
Ibuprofen	N	N
Naproxen	N	N
<b>Sweeteners</b>		
Aspartame	N	N
Saccharin	N	N
Sucralose	N	N
Table Sugar	N	N

"N" indicates that little or no fluorescence is induced.



Fluorescence interference in Raman analysis. Note how spectra obtained using 785 nm laser excitation are lacking critical information. For proper identification

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