

PORTABLE RAMAN ANALYZER'S PERFORMANCE IN THE DETECTION OF CONTROLLED DRUGS

Waynesburg University, Waynesburg, PA 15370

Kimberly Patnaude*, Michael Cipoletti

ABSTRACT

Raman spectroscopy is a well-established analytical technique that can be used to identify the chemical structure of a molecule. Consequently, Raman analyses have wide-ranging applications. Due to technological advances in optics and electronics, Raman analyzers have been increasingly miniaturized into rugged, hand-held devices, suitable for in-the-field utilization. These portable devices have been used extensively in the detection of explosives and hazardous chemicals. This research examines the effectiveness of a portable Raman analyzer for detection of seized controlled drugs.

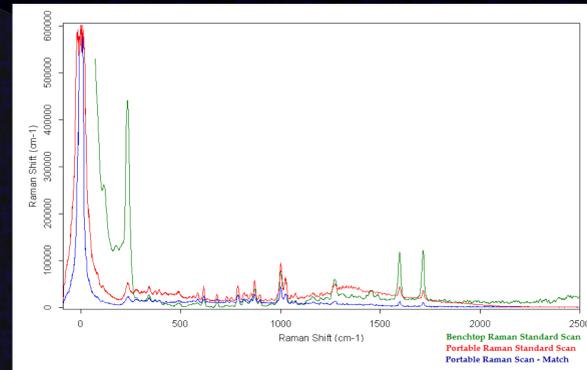
INTRODUCTION

- ❖ Rapid analysis of seized controlled drugs is a continuous problem in many fields.
- ❖ Laboratory tests on drugs is extensive and time consuming.
- ❖ Raman spectroscopy has been used for years to analyze the composition of seized materials, especially drugs
- ❖ Raman spectroscopy examines the inelastic scattering of light about molecules.
- ❖ Since Raman analysis is non-destructive and requires limited sample preparation, it is an ideal analytical technique.
- ❖ The vibrational patterns of a molecule are unique like a chemical fingerprint.
- ❖ These fingerprint patterns can be used to identify components of seized drugs.
- ❖ Portable, handheld Raman devices provide an opportunity for in-the-field analysis.

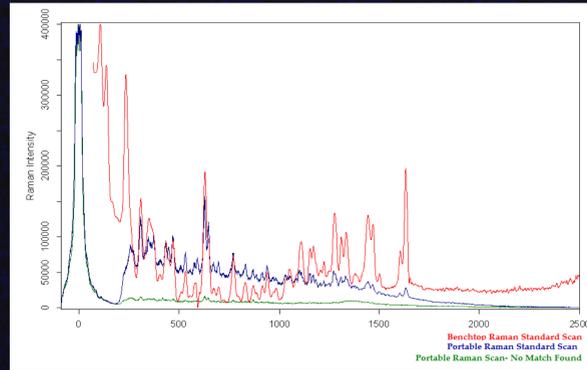
PROCEDURE

- ❖ A library of narcotics and other drug standards was built on the First Defender portable Raman at 785 nm.
- ❖ Using the Senterra benchtop Raman, scans were made of the same drug standards at 785nm.
- ❖ Scans of the drug standards were made on the portable Raman and compared to the portable Raman library.
- ❖ The scans from the portable and benchtop scans were analyzed.

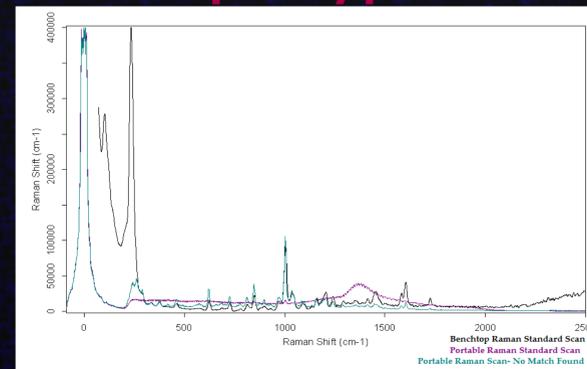
Cocaine



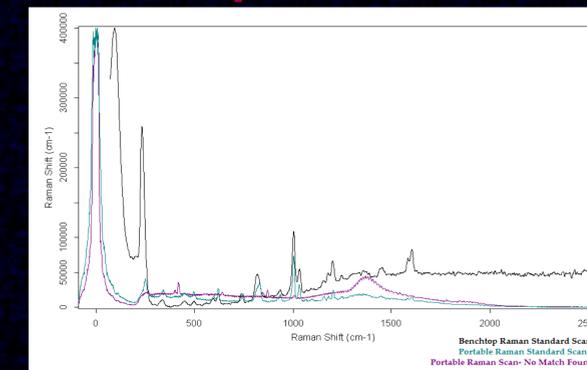
Codeine



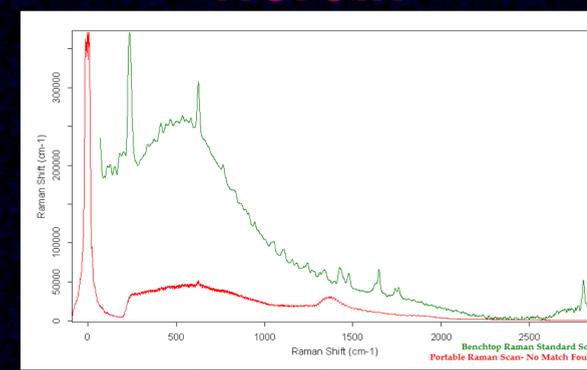
d-Propoxyphene



d-Amphetamine



Heroin



Sample Name	Portable Scan Result	Match	Scan Time
(+)cis Diltiazem HCl	c Diltiaze sig	Yes	9 minutes
Cannabinol	Cannabinol sig	Similar*	27 minutes
Cocaine HCl	Cocaine Hydrochloride	Yes	3 minutes
Codeine	Codeine sig	Similar*	5 minutes
d1-Cathinone HCl	dl Cathinone lip, dl-Cathinone	Yes	11 minutes
d-Amphetamine HCl	No Match Found	No**	16 minutes
d-Propoxyphene HCl	D-Propoxyphen gr	Similar*	19 minutes
d-Pseudoephedrine HCl	d-Pseudoaph gra, (+) Pseudoephedrine HCl	Yes	4 minutes
Fentanyl Citrate Salt	Fentanylcit sig, Fentanyl Citrate	Yes	4 minutes
Heroin	No Match Found	No**	5 minutes
Hydrocodone Bitartate	Hydrocodbit, Hydrocodone bitatrate	Yes	29 minutes
l Amphetamine HCl	l Amphet sig, d-Amphetamine gr	Yes	4 minutes
MDEA	34MDEA	Yes	3 minutes
MDMA HCl	dl MDMA lipo, dl MDMA	Yes	12 minutes
Methamphetamine HCl	Methamphetamine HCl	Yes	6 minutes
Oxycodone Hcl	Oxycodone Hydrochloride, Oxycod HCl sig	Yes	3 minutes
Papaverine	Papaverine sg	Yes	9 minutes
Quinine HCl	Quinine all	Yes	5 minutes

* The portable Raman library found no matches for the scanned drug but provided a suggested match. The suggested spectra was deemed "similar" by the portable Raman but not "similar" enough to deem a match.

** The portable Raman library found no matches for the scanned drug.

CONCLUSION

- ❖ Some drug scans provided a positive match from the portable Raman scan.
- ❖ These library matches are viable to be verified by an expert in spectral data.
- ❖ Other drug scans provided either no match all together or no match with a spectrum for a suggested match.
- ❖ In some cases, even a non-match from the portable Raman was useful. The spectra could then be examined by an expert for confirmation.
- ❖ Fluorescence is a major problem with Raman analysis, especially in handheld devices.
- ❖ If fluorescence can be reduced, either by increasing wavelength or employing a fluorescence compensator, handheld Raman devices would become more accurate.
- ❖ In conclusion, this method of analysis and confirming drug identities through a portable Raman device is practical for some drugs and not others.
- ❖ Further research should include analyzing seized street samples in addition to standard drug samples.

ACKNOWLEDGMENTS

ThermoFisher
SCIENTIFIC

