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RAMAN APPLICATIONS using Foram™3 785nm

Discrimination of methamphetamine precursors

Application Note
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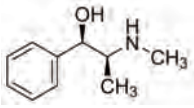
Ephedrine and pseudoephedrine have long been available in cold remedies as a decongestant. They are also common precursor materials from which illicit methamphetamine may be synthesized.

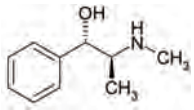
On a global scale, methamphetamine is one of the most consumed synthetic stimulant drugs and its prevalence owes itself, in part, to the relative ease in which it can be manufactured. For this reason legislation has been implemented to help monitor and control the global trade of ephedrine and pseudoephedrine. Since ephedrine and pseudoephedrine have become implicated in criminal activity the correct identification of these materials can be crucial for intelligence and in criminal investigations.

Compounds

Ephedrine and pseudoephedrine are diastereomers. They have the same molecular formula but they differ in their three-dimensional arrangement, specifically the hydroxyl (OH) group at the beta carbon position.



Ephedrine



Pseudoephedrine

Difficulty of Analysis

Most forensic laboratories use Gas Chromatography/Mass Spectrometry (GC/MS) for routine drug analysis.

However, GC/MS is not always appropriate for differentiating diastereomers such as ephedrine and pseudoephedrine without taking additional, often undesirable analytical steps such as derivatization.

The Raman Solution

This problem can be overcome using a spectroscopic technique such as Raman. Raman spectroscopy can provide rapid, sensitive, non-destructive analysis with minimal to no sample preparation required.

The Scientific Working Group for the analysis of Seized Drugs (SWGDRUG) lists Raman as a Category A technique, a group of techniques considered to have the maximum potential discriminating power.

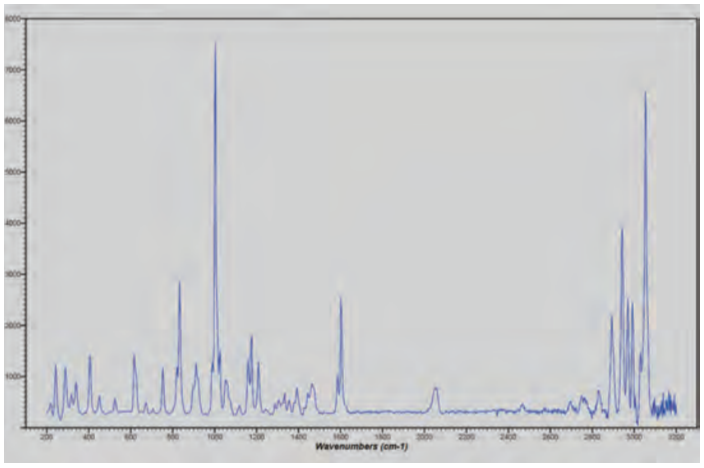
Experimental

In this application note ephedrine and pseudoephedrine (both in the hydrochloride salt form) were analysed using the FORAM 785nm microspectrometer. The excitation source was a near-infrared 785nm laser and the Raman shift was measured over a range of 200-3200 cm-1.

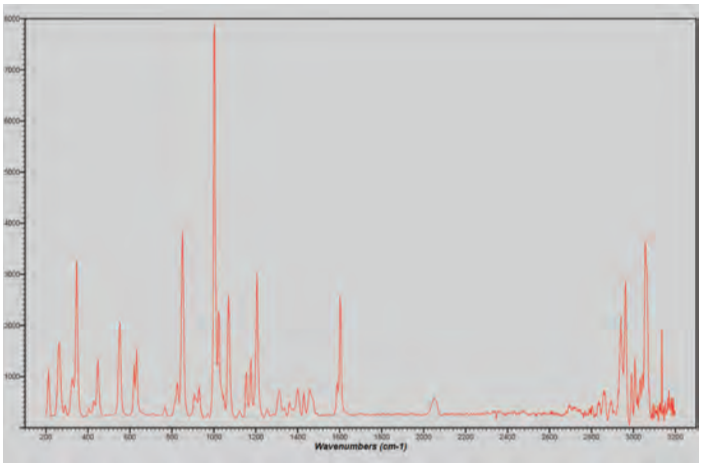
Samples were placed individually onto metallic foil.

The scan time for each sample was under three seconds and six scans were averaged to improve signal to noise.

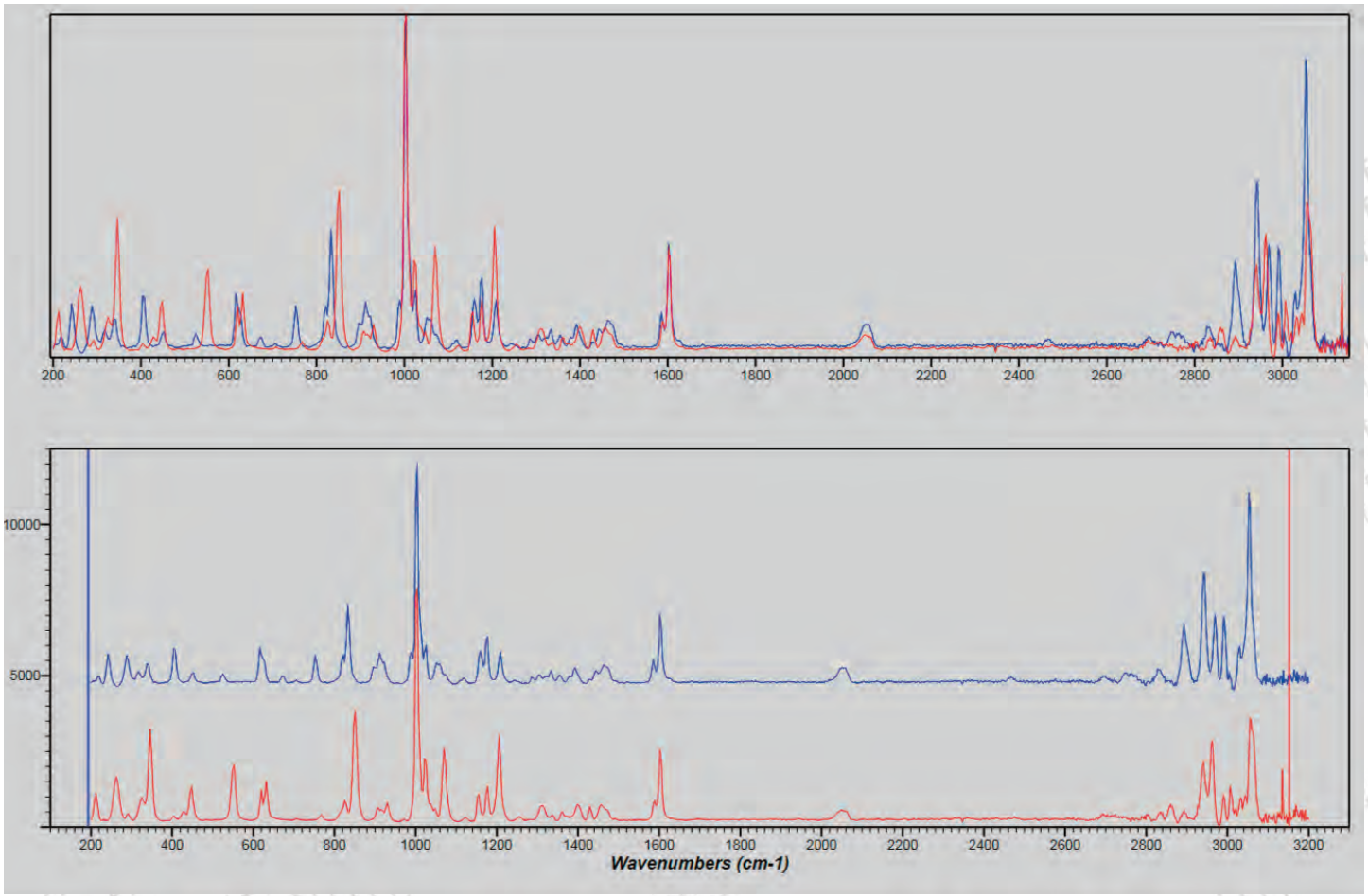
| Ephedrine Hcl |



| Pseudoephedrine Hcl |



| Spectra offset & normalised to highlight differences |



Results:

Ephedrine and pseudoephedrine are easily distinguished using the FORAM 785nm spectrometer. Results were obtained in seconds with minimal sample preparation. The narrow peaks that Raman spectroscopy can produce may also facilitate the interpretation of mixtures.

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