Commonly Abused Drug Screen Analysis

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Many businesses have recently adopted the federal government guidelines for drug testing of employees created by NIDA (The National Institute on Drug Abuse) and SAMSHA (The Substance Abuse and Mental Health Services Administration) as a result of federal legislation or drug related accidents and deteriorating work performance. The federal regulations require that tests detect a minimum of five specific categories of illicit drugs: cocaine, THC, amphetamines, opiates, and PCP. It is common for initial testing to be performed by test strips for fast screening. Positive results are then confirmed by GC-MS. The goal of this application is to show the anticipated chromatographic responses expected when similar conditions are applied to Zebron columns.

Experimental

Instrumentation: Analysis was performed on a HP 6890 gas chromatograph equipped with a 5973 MSD and G2614A autosampler (Agilent Technologies, Palo Alto, California, USA) using HP Chemstation software (Version D.00.01) for data analysis. The GC columns used were a Zebron ZB-5, 30m x 0.25mm x 0.25µm and a Zebron ZB-5, 15m x 0.25mm x 0.25µm. Carrier gas was UHP grade helium and held constant at 1.1mL/ min. Injector and interface temperatures were 250°C and 310°C respectively.

**Chromatographic Conditions:**

The oven program selected for the THC, cocaine, PCP, and amphetamines analysis started at 70°C to 120°C at 10°C/min. to 280°C at 20°C/min for 2 minutes. Injection mode was split at a ratio of 10:1. The detector was set to scan at a mass range of 50 to 450 amu. Much greater sensitivity can be achieved by applying Selected Ion Monitoring if allowable.

Sample Preparation:

All chemicals were ordered from Sigma.

THC Preparation: THC sample was prepared by combining 10µg of Δ^9THC, 2.5µg 11-nor Δ^9THC, and 5µg of 11-nor Δ^9THC-d$_3$. Solution was dried under ambient nitrogen. Volumes of 75µL of ethyl acetate and 75µL of N,O-Bis(trimethylsilyl)trifluoroacetamide (BSTFA) were added to residue of the dried samples and reacted at 70°C for 20 minutes and then analyzed directly.


Figure 1. THC Spectra
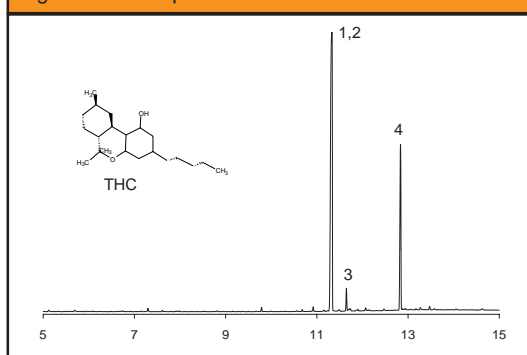
Peaks: 1. D$_3$-Carboxy-Δ^9-THC-TMS; 2. Carboxy-Δ^9-THC-TMS; 3. Cannabinol-TMS; 4. 11-nor-Δ^9-THC-TMS

Cocaine Preparation: Cocaine sample was prepared by combining 10µg of cocaine, benzoylegonine, and cocaine-d$_3$. Solution was dried under ambient nitrogen. Volumes of 75µL of ethyl acetate and 75µL of BSTFA were added to residue of the dried samples and reacted at 70°C for 20 minutes and then analyzed directly.
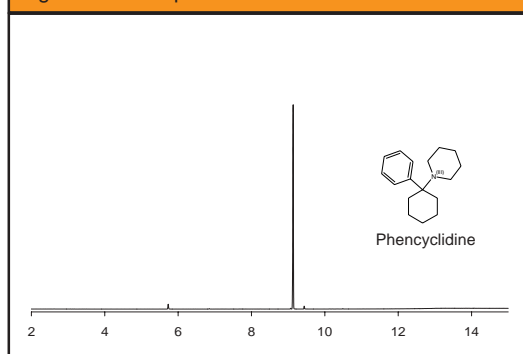

Figure 2. Cocaine Spectra
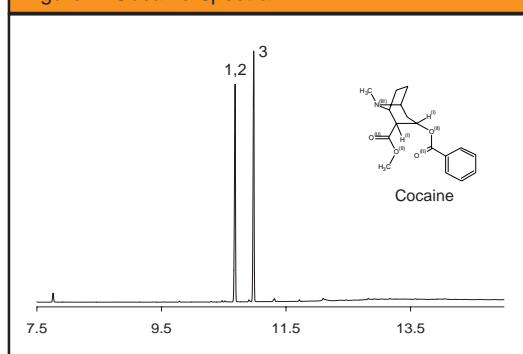
Peaks: 1. Cocaine; 2. D$_3$-Cocaine; 3. Benzoylecgonine-TMS

PCP Preparation: The PCP sample consisted of 20µg of PCP that was dried and reconstituted in 200µL of ethyl acetate.


Figure 3. PCP Spectra
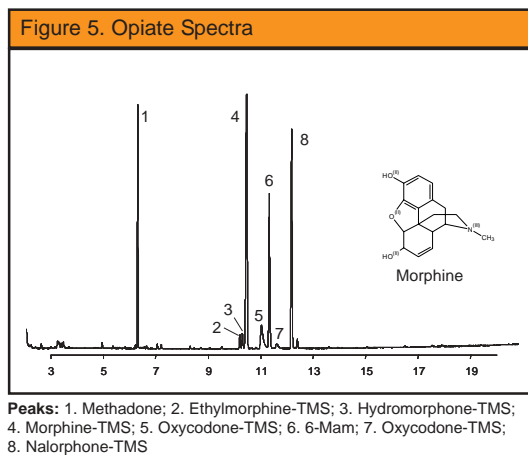
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Amphetamines preparation: Amphetamines sample was prepared by combining 10µg of D-amphetamine and 10µg of Methamphetamine and dried. Then added 100µL of PFPA (perfluoropropionicanhydride) and reacted for 20 minutes at 70°C. Sample was then dried and reconstituted in 150µL ethyl acetate.

Figure 4. Amphetamines Spectra

Peaks: 1. Amphetamine (pfp); 2. Methamphetamine (pfp)
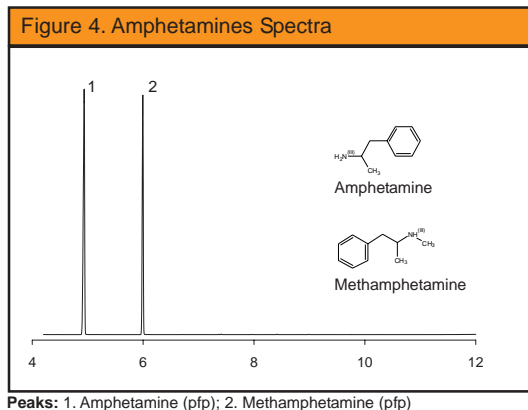
Opiates Preparation: Opiates sample was prepared by combining 10µg of each of the following: morphine, nalorphine, ± methadone, and oxycodone with 1µg of each ethylmorphine and 6-MAM. Solution was dried under ambient nitrogen. Volumes of 75µL of ethyl acetate and 75µL of BSTFA were added to residue of the dried samples and reacted at 70°C for 20 minutes and then analyzed directly.

Figure 5. Opiate Spectra

Peaks: 1. Methadone; 2. Ethylmorphine-TMS; 3. Hydromorphone-TMS; 4. Morphine-TMS; 5. Oxycodone-TMS; 6. 6-Mam; 7. Oxycodone-TMS; 8. Nalorphone-TMS

Ordering Information

Order Number	Description
7EG-G002-11	ZB-5 - 15m x 0.25mm x 0.25µm
7HG-G002-11	ZB-5 - 30m x 0.25mm x 0.25µm