

Simulant Analysis Using Short Cycle Thermal Desorption

The IACEM 980 is an extremely sensitive air monitoring instrument, capable of PPT sensitivity and may be used to collect and quantitate noxious air contaminants. This instrument is capable of highly reproducible analysis with precision, using a very short cycle time.

The IACEM 980 has dual collection tubes that operate in alternate cycles providing continuous sampling with cycles as short as four minutes. Collection of analytes may be performed at rates greater than one liter per minute. Enough analyte may be collected for both qualification and quantitation.

Dimethyl methylphosphonate (DMMP) is used as a military simulant for Sarin nerve agent. The short cycle analysis was done by reducing the standard tube and trap desorption times by 50%, or 1.5 minutes. The eight minute GC program was also reduced by 50% to four minutes. "Fast-flow" 10 mm(OD) tubes packed with Tenax-TA/HayeSep adsorbent were used in the analysis. The sample tubes were spiked with 5, 10, 15, 20 and 30 ng, and individually run multiple times. DMMP elution time was three minutes, as shown in Figure 1.

A plot of area counts vs concentration of the DMMP gives a regression coefficient of 0.9972, (see Figure 2).

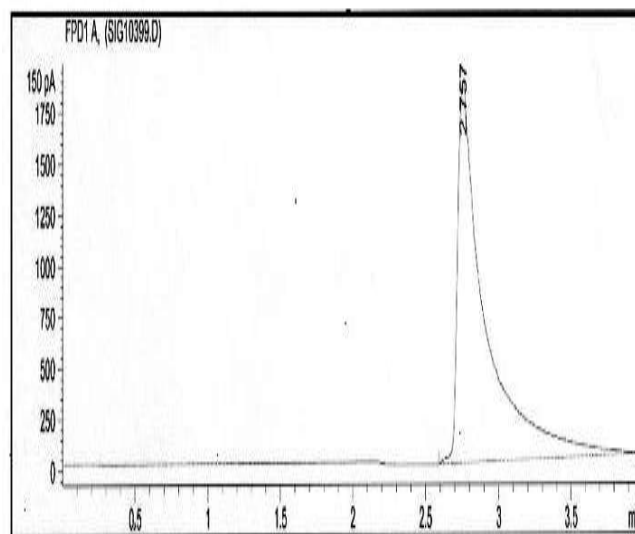


Figure 1. DMMP peak on FPD.

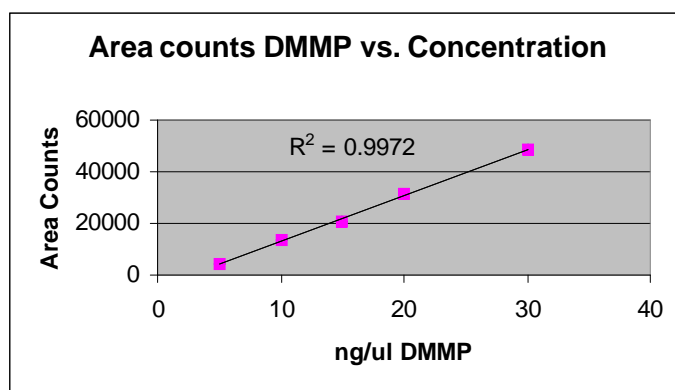


Figure 2.

Equipment

Samples were run on a CDS/Dynatherm IACEM 980 Air Sampler. The sampler was interfaced to an Agilent 6890 Gas Chromatograph using a dual Flame Photometric Detectors, one for phosphorus and one for sulfur.

IACEM Conditions:

Flow Rate: 2.0 ml/min
Valve Oven: 150°C
Transfer Line: 250°C
Tube Desorb: 275°C/1.5 minutes
Trap Desorb: 350°C/1.5 minutes
Sample Carrier: 30 ml/minute

Gas Chromatograph Conditions

Column: RTX 1701
Oven Program
Initial: 75°C/0.5 minutes
Ramp: 20°C/minute
Hold: 140°C/0.25 minutes
Detectors: Flame Photometric

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