



B67 The Applicability of Vacuum Ultraviolet (VUV) Spectroscopy as a Gas Chromatography (GC) Detection Technique for Synthetic Cannabinoids

Cory A. Vaught, BSc, George Washington University, 2100 Foxhall Road, NW, Somers Hall, Washington, DC 20007; Angelica D. Szewczak, BS, 8105 Leon Street, Philadelphia, PA 19136; Walter F. Rowe, PhD, George Washington University, Dept of Forensic Science, 2100 Foxhall Road, NW, Washington, DC 20007; Jonathan P. Smuts, PhD, VUV Analytics Inc., 715 Discovery Boulevard, Ste 502, Cedar Park, TX 78613; and Ira S. Lurie, PhD, George Washington University, Dept of Forensic Science, 2100 Foxhall Road, NW, Somers Hall, Lower Level, Washington, DC 20007*

After attending this presentation, attendees will understand some of the detection principles of Gas Chromatography-Vacuum Ultraviolet (GC-VUV) spectroscopy; in particular, the ability to differentiate synthetic cannabinoids by their absorption spectra. Attendees will gain insight into whether GC-VUV should be used by forensic chemists to identify and detect emerging drugs.

This presentation will impact the forensic science community by presenting a new instrumental technique that has the potential to enhance the ability to screen or confirm the presence of synthetic cannabinoids. This information would be beneficial in assisting the analyst in determining which controlled substance is present and in distinguishing between a controlled and a non-controlled emerging synthetic cannabinoid.

The recently introduced detection method of VUV spectroscopy provides for rapid and relatively low limits of detection via absorption in the wavelengths range of 115nm and 240nm, a region in which almost all chemicals absorb.¹ The detector is capable of both qualitative and quantitative analysis and requires minimal maintenance.¹ VUV spectroscopy can be particularly helpful in the identification of positional isomers through distinctive absorption spectra, which can be particularly difficult to distinguish by Mass Spectrometry (MS) techniques. The VUV detector can also de-convolute co-eluting compounds by matching the measured signals to distinctive library reference spectra.¹ The library spectra can be updated with standards of compounds, to have an expanding library for screening and confirmation purposes. This is particularly useful in aiding in the detection and differentiation of synthetic cannabinoids and their isomers, many of which have the same exact mass and similar retention times.

In this study, VUV spectroscopy was investigated for the detection and differentiation of synthetic cannabinoids. Separation was performed using GC with a VUV detector. The synthetic cannabinoids studied consisted of 22 synthetic controlled drugs and at least 8 non-controlled isomers of controlled JWH-018 were analyzed using GC-VUV. Although all 22 solutes could not be distinguished via retention time, unique UV spectra were obtained for the target solutes.

Although some co-elution was observed for the controlled synthetic cannabinoids and non-controlled isomers of controlled JWH-018, the co-eluting compounds could be differentiated from one another by their individual spectrum. For the most part, unique UV spectra was obtained for the individual isomers. It is possible to determine the basic structure of the controlled synthetic cannabinoids from the shape of the spectra. Furthermore, the work demonstrates that GC-VUV is particularly valuable for the detection of controlled and non-controlled isomers of synthetic cannabinoids and the spectra can be used in conjunction with the retention times and MS spectra from runs using GC/MS or other relevant technique to identify positional isomers and diastereomers.



Reference(s):

1. Fan H., Smuts J., Walsh P., Harrison D., Schug K. Gas Chromatography–Vacuum Ultraviolet Spectroscopy For Multiclass Pesticide Identification, *J. Chromatog. A.* 2015, 1389, 120-127.
-

Synthetic Cannabinoids, Isomers, VUV Spectroscopy