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Response mechanisms of marijuana, cocaine, methamphetamine, and flunitrazepam to environment

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Abstract

The environment may affect the illicit drugs and is able to produce impurities. The "forensic drug impurity signature" contains vital information for tracing their origin of manufacture and can be used to provide link in crime scene investigation. In this work the responses of marijuana, cannobinol, cocaine, methamphetamine, and flunitrazepam to the UV irradiations and elevated temperatures were investigated by UV-vis spectrophotometry and gas chromatography-mass spectrometry. UV-vis spectrophotometric data revealed that the elevated temperature causes four novel absorption peaks at 415 nm, 610 nm, 665 nm, and 960 nm, suggesting a chemical structure change of marijuana. The thermal reaction of marijuana seemed to follow the first order kinetics. The activation energy of the reaction was determined to be 7.6+/-0.5 kJ/mol. GCMS data revealed new GC peaks after UV treatment on these drugs. We found one new GC peak of cocaine sample at the retention time of 8.80 min, one new peak of cannobinol at 14.3 min, one new peak of methamphetamine at 12.5 min, and one new peak in flunitrazepam at 14.0 min. We also noticed the substantial change in GC pattern involving multiple GC peaks in the retention time of 2-13 min. The new GC peaks and the GC pattern change may serve as "chemical signatures" of controlled substances. Such information may promote the identification of the illicit drugs as a "chemical fingerprint" or construction of "illicit drug signature" database in forensic sciences.

Biography

Harvey J.M. Hou has completed his Ph.D. in Chemistry from Peking University in China and postdoctoral studies from Rockefeller University. Currently, he is the Associate Professor of Forensic Science at Alabama State University. He has published more than 68 papers in books and peer-reviewed journals including *Proc. Natl. Acad. Sci. USA*, *J. Am. Chem. Soc*., and *Angew. Chem. Int. Ed*. and served as an editorial board of *J. Photochem. Photobiol. B* and *Air Water Borne Diseases*. He is also the Editor of *Nano Photo Bio Science*. He is interested in microbial forensics, nanoforensics, forensic drug analysis, DNA profiling, and firearm/explosive analysis.