World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:18, No:08, 2024

Exploiting the Potential of Fabric Phase Sorptive Extraction for Forensic Food Safety: Analysis of Food Samples in Cases of Drug Facilitated Crimes

Authors : Bharti Jain, Rajeev Jain, Abuzar Kabir, Torki Zughaibi, Shweta Sharma

Abstract : Drug-facilitated crimes (DFCs) entail the use of a single drug or a mixture of drugs to render a victim unable. Traditionally, biological samples have been gathered from victims and conducted analysis to establish evidence of drug administration. Nevertheless, the rapid metabolism of various drugs and delays in analysis can impede the identification of such substances. For this, the present article describes a rapid, sustainable, highly efficient and miniaturized protocol for the identification and quantification of three sedative-hypnotic drugs, namely diazepam, chlordiazepoxide and ketamine in alcoholic beverages and complex food samples (cream of biscuit, flavored milk, juice, cake, tea, sweets and chocolate). The methodology involves utilizing fabric phase sorptive extraction (FPSE) to extract diazepam (DZ), chlordiazepoxide (CDP), and ketamine (KET). Subsequently, the extracted samples are subjected to analysis using gas chromatography-mass spectrometry (GC-MS). Several parameters, including the type of membrane, pH, agitation time and speed, ionic strength, sample volume, elution volume and time, and type of elution solvent, were screened and thoroughly optimized. Sol-gel Carbowax 20M (CW-20M) has demonstrated the most effective extraction efficiency for the target analytes among all evaluated membranes. Under optimal conditions, the method displayed linearity within the range of 0.3–10 µg mL–¹ (or µg g–¹), exhibiting a coefficient of determination (R2) ranging from 0.996–0.999. The limits of detection (LODs) and limits of quantification (LOQs) for liquid samples range between 0.020-0.069 µg mL-¹ and 0.066-0.22 µg mL-¹, respectively. Correspondingly, the LODs for solid samples ranged from 0.056-0.090 µg g-¹, while the LOQs ranged from 0.18-0.29 µg g-¹. Notably, the method showcased better precision, with repeatability and reproducibility both below 5% and 10%, respectively. Furthermore, the FPSE-GC-MS method proved effective in determining diazepam (DZ) in forensic food samples connected to drug-facilitated crimes (DFCs). Additionally, the proposed method underwent evaluation for its whiteness using the RGB12 algorithm.

Keywords : drug facilitated crime, fabric phase sorptive extraction, food forensics, white analytical chemistry
Conference Title : ICESP 2024 : International Conference on Extraction and Sample Preparation
Conference Location : New York, United States
Conference Dates : August 08-09, 2024