B31 Fabric Phase Sorptive Extraction (FPSE) Media: A Novel Forensic Sample Collection and Storage Device

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After attending this presentation, attendees will have a thorough understanding of the fabrication, working principle, and advantages of FPSE media as a forensic sample collection and storage device for accumulating fluidic samples from different crime scenes as the potential evidence of the crime, storing them for a prolonged period of time, if necessary, and analyzing them using chromatographic separation and mass spectrometric identification in order to obtain chemical profiles of the collected samples.

This presentation will impact the forensic science community by assisting those who are actively looking for a better alternative to conventional approaches of collecting fluidic samples from crime scenes. Future adaptation of the proposed forensic sample collection device as a standard practice will potentially minimize the majority of the sampling-related errors that often compromise the quality of the forensic evidence and consequently brings into question the admissibility of the evidence to a court of law.

Although recent decades have witnessed an exponential growth in modern analytical equipment possessing superior sensitivity, higher resolution, portability, and exceptional selectivity that synergistically help in solving forensic criminalistics cases faster with higher confidence, little progress has been conducted in standardizing a universal forensic sample collection protocol and tool thereof. Due to the lack of such a universal protocol and a sample collection media, crime scene sample collection teams often use a non-standard sample collection medium, such as cotton gauze, to collect fluidic samples from the crime scene as the potential chemical evidence. These non-standard sample collection tools often fail to collect pertinent chemical information from the collected sample in order to complement the criminal investigation and may be thrown out by the court of law due to inferior quality as forensic evidence.

FPSE media, developed by Kabir and Furton, have eloquently addressed a majority of the hurdles often experienced by the forensic sample collection team, such as variability between different collection media, the inability to retain chemical information for a prolonged period of time, and a lack of standard sample collection protocols, among others.[1] FPSE sample collection media are prepared using flexible fabric substrate (cellulose/polyester/fiber glass) coated with high-efficiency, sol-gel hybrid inorganic-organic sorbents. Due to the ultra-thin film of the robust sorbent system, the FPSE media retains its flexibility. The chemical bonding between the substrate and the sol-gel sorbent network offers unprecedented mechanical and chemical stability to the sample collection device. As such, the FPSE media can be used to wipe any fluidic forensic sample from the crime scene, even from uneven surfaces. The sponge-like porous architecture of the sol-gel coating on the FPSE media allows rapid permeation of the fluid through its body for effective analyte-sorbent interaction, leading to the successful accumulation of the chemical information of the suspect sample. Due to the strong interaction between the analytes and the FPSE sorbents, the FPSE media containing the chemical information can be stored at ambient conditions under proper chain of custody without risking any potential loss of the chemical information. A small volume of organic solvent can be used to desorb collected analytes for chromatographic profiling.

Analytical data obtained from a number of real-life applications of FPSE sample collection and storage media mimicking different crime scene samples, including blood and saliva, will be presented, showcasing the advantages of FPSE forensic sample collection and storage media.

Reference(s):

1. Kabir A., Furton K.G. F*ield Sampling Kit for Chemical Recovery, Storage, and Profiling, Method of Making and Using the Kit, and a Dynamic Fabric Phase Sorptive Extraction (DFPSE) Media.* Patent pending. USPTO Serial Number 61/954,293. March 17, 2014.

Forensic Sampling, FPSE, Sample Collection