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Fabric Phase Sorptive Extraction (FPSE): A new direction in metabolomics disease biomarker discovery

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Metabolomics plays a vital role in discovering potential disease biomarkers from blood plasma or serum samples. Due to the enormous complexity of whole blood as the sample matrix, either plasma or serum are used in metabolomics disease biomarker discovery research. During the transformation of whole blood into plasma or serum prior to applying conventional sample preparation techniques such as solid phase extraction (SPE) and liquid-liquid extraction (LLE), a significant portion of the analytical information disappears, resulting in negligible success in discovering potential disease biomarkers. Fabric phase sorptive extraction (FPSE), a new generation sample preparation technology, has offered a paradigm shift approach in metabolomics sample preparation. FPSE innovatively combines the benefits of solid phase extraction (SPE) (works under exhaustive extraction principle) and solid phase microextraction (works under equilibrium extraction principle) into a single sample preparation technology platform. FPSE utilizes a flexible and permeable fabric substrate, coated with high-performance sol-gel sorbents as the extraction media. This uniquely designed extraction medium is capable of extracting target analyte(s) directly from whole blood. Due to the special geometry of FPSE medium (flexible, flat, and permeable) and sponge-like porous architecture of sol-gel sorbents, rapid analyte mass transfer occurs between the bulk sample and the extraction medium, resulting in almost exhaustive extraction within a fraction of time required in other conventional sample preparation techniques. FPSE is particularly suitable for analyzing target analytes e.g., metabolites, biomarkers directly from whole blood without requiring any protein precipitation or other pre-extraction sample cleaning/manipulation. After extracting the target analyte(s) directly from the whole blood, FPSE media is exposed to a small volume of organic/organo-aqueous solvent for eluting the extracted analyte(s). Low viscosity of organic solvent, capillary force of the fabric support and sponge-like porous architecture of sol-gel network allows fast diffusion of organic solvent into the FPSE medium for quick and complete recovery of the extracted analyte(s). As a result, FPSE completely eliminates time consuming and error prone solvent evaporation and sample reconstitution step which are often considered as integral part of solid phase extraction/liquid-liquid extraction work-flow. During the solvent mediated elution/back-extraction, any protein or matrix interferents adhered to the FPSE medium precipitates out and a final centrifugation of the resulting solution prior to injecting into the analytical instrument ensures clean particle-free highly concentrated target analyte(s). Fabric phase sorptive extraction

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has already developed a large number of sol-gel sorbents specifically suitable for polar metabolites/biomarkers such as sol-gel polyethylene glycol, sol-gel chitosan, sol-gel Carbowax 20M, sol-gel polycaprolactone-polydimethylsiloxane-polycaprolactone to name a few. These high-efficiency sorbents have been found equally effective for analytes with wide range of polarity. As a consequence, searching for a new disease biomarker from whole blood in presence of numerous endogenous and exogenous interferents is no longer a wishful thinking but an achievable reality. In the current talk, some new and fascinating data on metabolomics sample preparation using FPSE and a comparison between FPSE and conventional sample preparation techniques will be presented.

Biography

Abuzar Kabir, a Research Assistant Professor at the International Forensic Research Institute (IFRI), Department of Chemistry and Biochemistry, Florida International University (FIU), Miami, Florida, USA, is a Separation Scientist and Materials Chemist. He has received his Ph.D. in analytical chemistry from University of South Florida (USF), Tampa, Florida, USA with specialization in sol-gel synthesis. He has invented 16-patented technologies in the area of chromatographic separation and analytical/bioanalytical sample preparation. He has also authored/co-authored 9 book chapters, 6 review articles, 46 research articles and 89 conference papers.

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