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A comprehensive study of a new versatile device based liquid phase micro extraction for stopped-flow and double-flow conditions in a single step

Maria Ramos Payan and Garcia Gonzalez
University of Seville, Spain

A new geometry for a versatile microfluidic-chip device based liquid phase micro extraction was developed to enhance the preconcentration in microfluidic chips and to enable double-flow and stopped-flow working modes. The microchip device was combined with a HPLC procedure for the simultaneous determination of two different families as model analytes, which were parabens and Non-Steroidal Anti-Inflammatories (NSAIDs). The new miniaturized microchip proposed in this work allows not only the possibility of working in double-flow conditions, but also under stagnant conditions (stopped-flow) (SF-μLPME). The sample (pH 1.5) was delivered to the SF-μLPME at 20 μL min^{-1} while keeping the acceptor phase (pH 11.75) under stagnant conditions for 20 minutes. The highest enrichment factors (between 16 and 47) were obtained under stopped-flow conditions at 20 μL min^{-1} (sample flow rate) after 20 minutes of extraction whereas the extraction efficiencies were within the range of 27-81% for all compounds. The procedure provided very low detection limits between 0.7 and 8.5 μgL^{-1} with a sample volume consumption of 400 μL. Parabens and NSAIDs have successfully been extracted from urine samples with excellent clean up and recoveries over 90% for all compounds. In parallel, the new device was also tested under double-flow conditions, obtaining good but lower enrichment factors (between 9 and 20) and higher extraction efficiencies (between 45 and 95) after 7 minutes of extraction, consuming a volume sample of 140 μL. The versatile device offered very high extraction efficiencies and good enrichment factor for double-flow and stopped-flow conditions, respectively. In addition, this new miniaturized SF-μLPME device significantly reduces the costs compared to the existing analytical techniques for sample preparation since this microchip requires few microliters of sample and reagents and it is reusable.

Biography

Maria Ramos Payan has pursued her PhD from University of Seville, Spain and Postdoctoral studies from University of Copenhagen, Denmark, University of North Carolina, USA and Microelectronic National Center of Barcelona, Spain. She is the Leader of the microfluidic research line. She has published more than 30 papers in reputed journals and has been serving as an Editorial Board Member of repute.

ramospayan@us.es

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