Maria Ramos Payan et al., J Anal Bioanal Tech 2018, Volume 9
DOI: 10.4172/2155-9872-C2-031

Study of the microchip device's geometry based on the distribution constant of the analytes

Maria Ramos Payan and Garcia Gonzalez
University of Seville, Spain

The chip geometry is one of the most important parameters to optimize since the length, width and depth will determine the efficiency of the extraction. On the other hand, the efficiency of the liquid membrane extraction depends on several different parameters. These include flow rate, dimensions of the channels of the membrane holder, the membrane porosity and thickness, chemical composition of the phases, kinetic and thermodynamic properties. Basically, two main sets of conditions for SLM extraction can be distinguished. With donor-controlled conditions the rate of extraction is controlled by the mass transfer in the donor phase. This is the case when the distribution coefficient K_d between the organic membrane phase and the donor phase is relatively large (K_d>10) for the analyte molecules. Diffusion coefficients in the phases also play a role here when liquid phase micro extraction is the technique used for the extraction. With donor-controlled conditions, the extraction efficiency should increase with the flow rate of the donor buffer. Also, if K_d is small, or the mass transfer in the membrane is unusually low, the mass transfer in the membrane phase controls the rate of extraction (membrane-controlled conditions). In that case, the donor flow rate per seconds is not important and the extraction efficiency is determined by the total extraction time. Then, the dimensions of the channel have a large influence on the recovery. The depth of the donor channel should be as low as possible so that a large part of the sample is in contact with the membrane. This is particularly important when the mass transfer in the donor phase is the limiting factor (that is, K_d is high). On the other hand, a very shallow channel (<0.1 mm) is hard to machine and can cause stoppage, especially with viscous samples such as plasma. To achieve a high recovery, a large exposed membrane area is preferable, but a too wide channel can cause bulging of the membrane, while the length is limited by the back pressure arising in the channel. The exposed membrane area is also determined by the maximum acceptable volume and possible depth of the acceptor channel. Based on this discussion, we propose the most suitable channels dimension for a microchip device based on the distribution constant of each analyte and the time required to be extracted through the support liquid membrane by passive diffusion.

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

Notes: