Electro-driven extraction across a polymer inclusion membrane in a flow-through cell

Abstract

A flow-through arrangement for electrodriven extraction across a polymer inclusion membrane was developed. Sample introduction into the donor chamber was continuous, while the acceptor solution was stagnant. By adjustment of the total volume of the donor solution pumped through the cell the best compromise between enrichment factor and extraction time can be set. The enriched extract was analyzed by capillary electrophoresis with contactless conductivity detection. Membranes of 20 !m thickness were employed which consisted of 60% cellulose triacetate as base polymer, 20% o-nitrophenyl octyl ether as plasticizer, and 20% Aliquat 336. By passing through 10 mL of sample at a flow rate of 1 mL/min the model analytes glyphosate (a common herbicide) and its major metabolite aminomethylphosphonic acid could be transported from the aqueous donor solution to the aqueous acceptor solution with efficiencies >87% in 10 min at an applied voltage of 1500 V. Enrichment factors of 87 and 95 and limits of detection down to 43 and 64 pg/mL were obtained for glyphosate and aminomethylphosphonic acid, respectively. The intra- and interday reproducibilities for the extraction of the two compounds from spiked river water were about 6 and 7% respectively when new membranes were used for each experiment. For consecutive extractions of batches of river water with a single piece of membrane a deterioration of recovery by about 16% (after 20 runs) was noted, an effect not observed with purely aqueous standards.