USE OF A SEQUENTIAL INJECTION SYSTEM TO MONITOR THE EFFICIENCY OF A CONSTRUCTED WETLAND

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Flow analysis techniques, namely sequential injection analysis (SIA), enable a fast, reliable and real time determination representing a highly effective monitoring tool. In addition, the versatility of the selection valves used in SIA allows determination of different parameters with the same manifold in a multiparametric assessment.

In this work a sequential injection system was used for the multiparametric determination of NO_x, NH_x and PO_4^{3-} in samples from a constructed wetland for domestic wastewater treatment, in order to monitor its efficiency concerning the removal or reduction of the concentration of those compounds. The biparametric determination of NO_2^- and NO_3^- is based on the Griess reaction for NO_2^-, where the NO_3^- is previously reduced in a coppersised cadmium column; the details of this biparametric determination have been previously described [1]. For the ammonium determination, a gas diffusion unit was used to separate ammonia from the alkalized sample. After diffusion, ammonia was converted to ammonium in an acceptor stream of bromothymol blue (BTB) and the colour change measured at 620 nm. The influence of the sample volume, together with the hydroxide concentration, was studied for the required dynamic range. As for the phosphate determination, the well-known molybdenium blue reaction was used. The sequence of aspiration and the concentration of the different reagents was studied for this particular application. The characteristics of the sequential injection system are summarized in Table 1.

Table 1. Features of the methods

Parameter	Quantification range	Calibration curve	LOD (µM)	LOQ (µM)	Determination rate (h^{-1})
Ammonium	0.033-0.332 mM	$A = 0.631 \pm 0.050\ [NH_4^+] + 0.087 \pm 0.029$	4.9	16.3	31
Phosphate	5.54 – 49.9 µM	$H^a = 0.091\ (\pm 0.008)\ [H_2PO_4^-] - 0.089\ (\pm 0.057)$	2.3	2.5	32
Nitrite	0.50 – 8.00 µM	$A = 5.06 \times 10^{-2} \pm 1.02 \times 10^{-3}\ [NO_2^-] - 1.24 \times 10^{-4} \pm 4.68 \times 10^{-3}$	0.11	0.36	33
Nitrate	12.5 – 305 µM	$A = 3.17 \times 10^{-2} \pm 7.57 \times 10^{-5}\ [NO_3^-] - 8.38 \times 10^{-2} \pm 1.19 \times 10^{-2}$	3.7	12.2	33

[a] height in cm

References

[1] R. B. R. Mesquita, M. T. S. O. B. Ferreira, R. L. A. Segundo, C. F. C. P. Teixeira, A. A. Bordalo, A. O. S. S. Rangel, Anal. Methods 1 (2009) 195.

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