QUÍMICA AGRO-MAR-ALIMENTAR

In-line phosphate pre-concentration in a flow injection method platform for monitoring fertilizers excess in soil leachates

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Fertilizers have been intensively used in agricultural activities and the inorganic phosphate derived from them is often found in excess in ground waters. Phosphate is a well-known contaminant and its content is an indicator of water quality, so it is important to have an efficient monitoring of the soil leaching process.

The conventional soil testing is based on manual or mechanical soil sampling and extraction processes, which are time consuming. To study the soil leaching process, it is necessary to mimic natural conditions in laboratory models and to develop real-time analytical tools. The aim of this work is the development of an automatic, low cost flow analysis method, capable of real-time monitoring of the soil leaching processes using spectrophotometric detection. The developed system has a pre-concentration step, incorporated in a flow injection (FI) system. Most methods for phosphate determination in water are based on the formation of phosphomolybdate and its reduction to molybdenum blue. The FI system was developed using a commutator to study the use of the anionic resin, AG1-X8, for phosphate pre-concentration. In this FI system, the resin column was loaded with 500 µL of phosphate standard/sample (L1) and then eluted with 75 µL of a sodium chloride solution (L2), before merging with ammonium molybdenum and ascorbic acid solutions.

The developed FI system can be applied to different water samples, namely river water, sea water, estuary water, well water and rain water. In this work, it was used in the monitoring of the soil leaching process by using laboratory scale soil columns (LSSC) to obtain the soil leachates. The LSSC columns were explored to understand the behaviour of ions in soils (mobility, transport and fate).
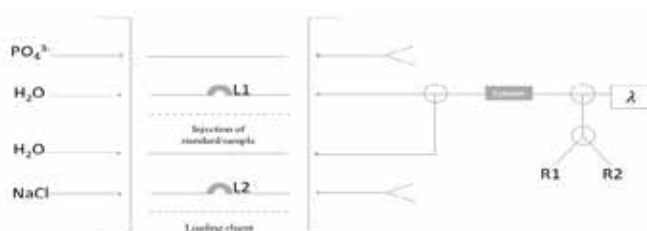
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Fig. 1. Flow injection manifold for the determination of phosphate after in-line pre-concentration; L1, sample loop; L2, eluting solution loop, R1, Molybdenum blue reagent; R2, ascorbic acid solution, Column, packed AG1-X8 resin for phosphate pre-concentration.