

FLOW ANALYSIS XI

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***DETERMINATION OF ZINC IN NATURAL WATERS USING A
MULTISYRINGE FLOW INJECTION ANALYSIS APPROACH
COUPLED WITH A LONG LIQUID WAVEGUIDE CAPILLARY
FLOW CELL***

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Zinc is a natural microelement important for maintaining the normal physiological processes in living organisms. It is involved in various biochemical processes and is essential for the functioning of enzymes that control protein synthesis and the growth/repair of cells. However, the excess intake is prejudicial and the maximum tolerable daily intake in humans is 1.0 mg kg^{-1} body weight [1]. For all these reasons it is crucial to develop simple, robust and low cost methods to accurately determine its concentration in water samples and flow based strategies are very suitable for this goal. However, analytical difficulties might arise due to the low concentration level of the analyte.

The spectrophotometric determination can be based on the colorimetric reaction between zinc and zincon. Zincon is a well known spectrophotometric reagent for zinc and copper. It reacts with zinc at pH 8-9.5 and with copper at pH 5-9.5, and at pH 5-7 copper zincon complexes are strongly favoured [2]. Efficient control of pH is therefore crucial to assure selectivity of the method and this is usually achieved by applying buffer solutions with high buffering capacity. However, this approach frequently results in pronounced "schlieren" signal when conventional spectrophotometric flow cells are applied. In the present work, a long liquid waveguide capillary cell with 100 cm of optical path was applied to increase the sensitivity of the spectrophotometric detection mode. For flow manipulation/programming a multi-syringe flow injection analysis (MSFIA) was developed.

The developed flow method offers some advantages as low sample/reagent volumes, low waste volumes with a determination rate of 40 h⁻¹. The developed method is suitable for samples with zinc concentration between 2-80 µg/L. The work is focused on the zinc determination but the development of a multi-parametric system for copper and zinc is the final objective of this work.

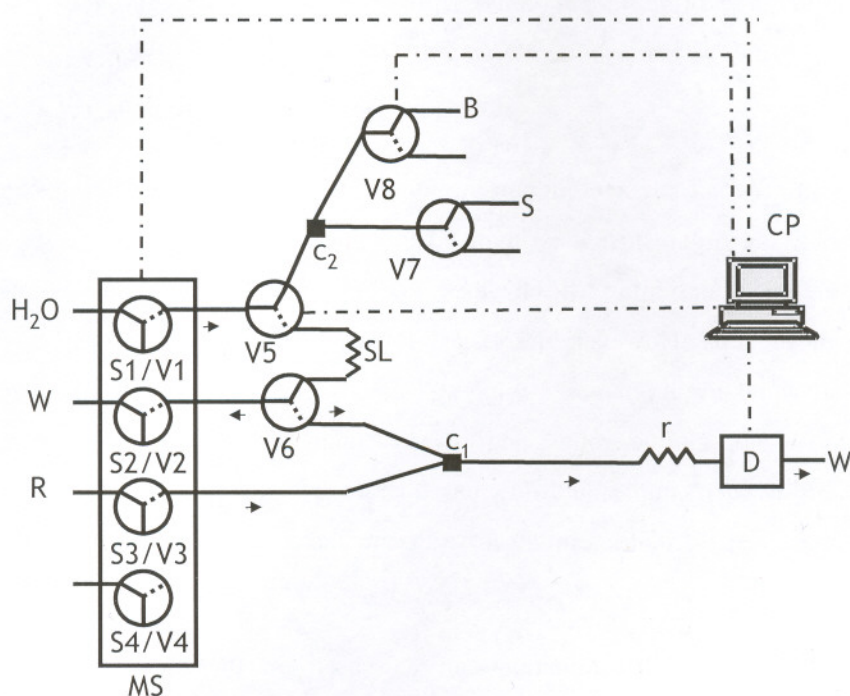


Figure 1. Multi-syringe flow injection analysis manifold for the determination of zinc in waters. S_i: syringes, V_i: solenoid valves; SL: sample loop (400 µL); r: reaction coil (200 cm); c_i: confluences; D: detector (100 cm of optical path); CP: computer; W:waste; S: sample or standard; B: buffer; R: color reagent (zincon).

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