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**CONTRIBUTIONS**

## P131 SEQUENTIAL INJECTION SYSTEM FOR THE SPECTROPHOTOMETRIC KINETIC DETERMINATION OF ALUMINIUM IN WATERS

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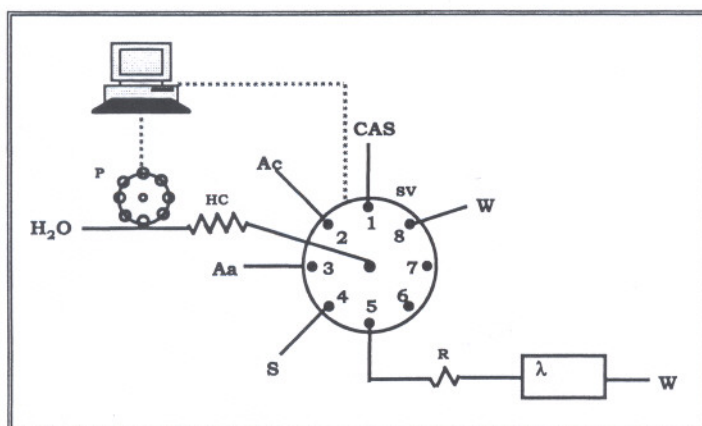
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In water the parameters being under permanent observation are of both chemical and microbiological nature. Among the chemical parameters, metals stand on a privileged position due to their highly negative impact on human health. Metals such as aluminium or iron have only non-enforceable guidelines concerning the limits allowed, as secondary drinking water regulations [1]. In the case of aluminium, the possible relationship between aluminium intake in human diet and Alzheimer's disease [2] has given it an extraordinary relevancy. Even though the intake from water represents only a small contribution, there are those who defend that the aluminium in water is more readily absorbed by human body [2]. Then, the increase of aluminium level in waters may result in a dangerous increase in the human diet intake and overload the body capacity for excreting aluminium leading to its accumulation. Naturally occurring aluminium exists only combined, non toxic forms, which limits its bioavailability. The general acidification of the environment, resulting from pollution, causes the release of the ionic aluminium from its combined/complexed form. Consequently there is an increase in the dissolved aluminium content in natural waters. When treated water is involved the presence of toxic aluminium, ionic form, in the finished water can result from the use of coagulants, aluminium salts, in the water treatment plants [3].

A sequential injection (SI) methodology for the determination of aluminium based on its reaction with chrome azurol S is presented. The use of SI methodology presents high versatility, which enables the fulfilling of all the conditions for the colour reaction optimisation in line, including pH adjustment

and interference minimisation. This way water samples could be directly introduced in the system, for aluminium determination, after collection. However, the direct introduction of the sample could arise some problems when waters from treatment plants are involved due to possible colour or turbidity interference. To overcome this problem, a kinetic methodology for the same reaction was developed. Again taking advantage of the SI versatility, the appropriate changes in the sequence protocol allowed the kinetic determination to be carried out with the same manifold. The proposed system, shown in Fig. 1, aimed for aluminium determination in surface, treated and drinking waters.



**Fig. 1** - Sequential injection manifold for the spectrophotometric determination of aluminium in water samples: **CAS** – chrome azurol S; **Ac** – sodium acetate; **Aa** – ascorbic acid; **S** – water sample or standard; **W** – waste; **P** – peristaltic pump; **SV** – eight port selection valve; **HC** – holding coil; **R** – reaction coil; **λ** – spectrophotometer.

The features of the developed methods, direct (SI d) and kinetic (SI k) are summarised in the table below.

Method	Dynamic concentration range (mg L <sup>-1</sup> )	LOD <sup>a</sup> (mg L <sup>-1</sup> )	LOQ <sup>b</sup> (mg L <sup>-1</sup> )	Analytical cycle (min)	Sample frequency (det. h <sup>-1</sup> )	Efluent volume (mL)
SI d	0.040 - 0.500	0.020	0.030	1.05	57	2.8
SI k	0.050 - 0.300	0.012	0.033	1.93	31	3.4

<sup>a</sup> - limit of detection

<sup>b</sup> - limit of quantification

**References:**

- [1] United States Environmental Protection Agency, Current drinking water standards – List of contaminants, <http://www.epa.gov/safewater/mcl.html>, last accessed July 2006.
- [2] Alzheimer Scotland – Action on dementia, Aluminium and Alzheimer's disease, information sheet, <http://www.alzscot.org/pages/info/aluminium.htm>, last access July 2006.
- [3] WHO - World Health Organization. 1998. Guidelines for drinking-water quality, 2<sup>nd</sup> ed. Addendum to Vol.2. Health criteria and other supporting information, World Health Organization, Geneva, Switzerland.

**References:**

- [1] United States Environmental Protection Agency, Current drinking water standards – List of contaminants, <http://www.epa.gov/safewater/mcl.html>, last accessed July 2006.
- [2] Alzheimer Scotland – Action on dementia, Aluminium and Alzheimer's disease, information sheet, <http://www.alzscot.org/pages/info/aluminium.htm>, last access July 2006.
- [3] WHO - World Health Organization. 1998. Guidelines for drinking-water quality, 2<sup>nd</sup> ed. Addendum to Vol.2. Health criteria and other supporting information, World Health Organization, Geneva, Switzerland.