Programmable flow injection. Principle, methodology and application for trace analysis of iron in a sea water matrix

Mariko Hatta, Christopher I. Measures, Jaromir (Jarda) Ruzicka

www.elsevier.com/locate/talanta

PII: S0039-9140(17)31046-9
DOI: https://doi.org/10.1016/j.talanta.2017.10.007
Reference: TAL18005

To appear in: *Talanta*

Received date: 1 September 2017
Revised date: 4 October 2017
Accepted date: 4 October 2017

Cite this article as: Mariko Hatta, Christopher I. Measures and Jaromir (Jarda) Ruzicka, Programmable flow injection. Principle, methodology and application for trace analysis of iron in a sea water matrix, *Talanta,* https://doi.org/10.1016/j.talanta.2017.10.007

Programmable flow injection. Principle, methodology and application for trace analysis of iron in a sea water matrix.

Mariko Hatta, Christopher I. Measures, Jaromir (Jarda) Ruzicka

1000 Pope Road, Department of Oceanography University of Hawaii, Honolulu, HI 96822, USA.

mhatta@hawaii.edu

Abstract.

Automation of reagent based assays by Flow Injection is based on sample processing, in which a sample flows continuously towards and through a detector for monitoring of its components. There are three drawbacks to using this approach. The constant *continuous forward flow*: continually consumes reagents and generates chemical waste and necessitates a compromise when optimizing the performance of the reagent based assay. The reason is that individual steps of an assay protocol, i.e., sample and reagent metering, mixing, incubation, monitoring and efficient washout are carried out most efficiently on different time scales and therefore at different flowrates. Programmable Flow Injection (pFI) eliminates all three drawbacks and permits the execution of optimization of the assay protocol by means of a computer. This paper details this novel approach to method development by optimization of an assay of iron at nanomolar levels and its application to its determination in a sea water matrix. The pFI method was developed in two variants: Stop in Holding Coil (SHC) and Stop in Flow cell (SFC). The SHC method has a Limit of Detection (LOD)= 3.1 ppb or 55 nM Fe, precision of 1.9 % r.s.d. at ~ 90 nM, and sampling frequency of 90 samples/hr. The SFC method had LOD= 0.57 ppb or 10 nM Fe, precision of 0.8 % r.s.d. at ~90 nM, and sampling frequency of 40 samples/hr and its sensitivity is independent of the salinity of the matrix. The SFC method, and its manual equivalent, was used for the determination of dissolved Fe (II) that had been spiked into several samples of seawater that had been diluted with various volumes of deionized water to mimic coastal seawater. The results showed good agreement between both the SFC and the manual methods.