

Automatization of chemical methods of analysis utilizing flow injection system for promoting the efficient and advanced uses of seawater resources

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Simple, rapid and sensitive methods of analysis have been developed based on a new concept of flow injection (FI system) for determination of phosphate and ferrocyanide in salts which are able to contribute to promote the food safety and the efficient and advanced uses of seawater resources. In order to achieve highly sensitive and selective determination of phosphate in sea salts, the separation/preconcentration of phosphate in salts as molybdovanadophosphoric acid with a Sephadex G-25 gel column was developed and directly in-line coupled with fluorimetric detection based on the oxidation of thiamine in a flow system.

For the determination of food additive ferrocyanide at ppm to sub-ppm levels in salts, a new spectrophotometric detection was developed utilizing the reduction of Fe(III) complex with 1,10-phenanthroline by ferrocyanide which was directly in-line coupled with anion-exchange separation/preconcentration from NaCl matrix in a flow system. The present FI systems offer many advantages with respect to simplicity and sensitivity, with a short analysis time (about 12 min), low limit of determination (0.2 ppb and 0.5 ppm(tentative) in salts for phosphate and ferrocyanide, respectively) and good reproducibility(rsd < 3 %). No complicated manual operation was needed and glass apparatus such as beaker, flask, and pipets usually required for analysis was omitted because most analytical operations were done automatically in flowing stream of solution in a narrow bore PTFE tubing system. Those additional advantages over the conventional batch system include low sample and reagent consumption, high sampling frequency, low contamination, easy automation and high sensitivity.