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Search of the Salt and Treated Seawater for Oxyhalogen Ions and Development of Highly Sensitive and Rapid Method of Analysis for Those Ions

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Summary

A novel detection reaction has been developed for oxyhalogen ions such as bromate, chlorate, iodate and periodate which is based on the accelerated oxidation of thiamine in the presence of small amounts of V (V) and spectrofluorimetric measurement of resultant thiochrome (λ_{ex} : 400 nm, λ_{em} : 450 nm). A flow injection system utilizing this detection reaction is presented for determining those oxyhalogen ions at ppb to sub-ppm levels. The variables relating to such reaction and manifold were studied in detail and the optimal conditions and manifold configurations were established. The estimated limit of determination (10σ) were 0.2 ng/mL, 0.2 $\mu\text{g/mL}$ and 2 ng/mL for bromate, chlorate and iodate, respectively. Only about 10 min was required for analytical measurement after sample injection and no complicated manual operation was needed. Anion exchange separation / preconcentration was successfully coupled in-line with this detection reaction in the flow injection system in order to determine trace those oxyhalogen ions in sea salt and sea water. A Muromac 1X8 anion exchange resin column and 0.5 M NaCl as an eluent (carrier) were used for this purpose. The limit of determination (10σ) by the proposed flow injection system was 0.2 ng/mL for bromate which corresponds to 0.007 $\mu\text{g/g}$ in the salt sample.