DETERMINATION OF IODINE, IODATE AND IODIDE BY COMBINED SOLID-PHASE EXTRACTION WITH POLYURETHANE FOAMS AND DIFFUSE REFLECTANCE SPECTROSCOPY

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Because of its speed and effectiveness, solid-phase extraction has become the preferred technique for preconcentrating analytes prior to their analysis by other techniques. In most cases, the concentrated analytes are eluted from the extractant particles for further analyses, usually by means of an organic solvent. It is also possible to eliminate post-extraction analysis by quantifying the amount of an extracted analyte directly on the extraction disk, for example, of polyurethane foam.

In this work, a rapid methodology for trace analyses of iodine, iodate and iodide using solid-phase extraction and with polyurethane foams and diffuse reflectance spectroscopy is described.

1. Iodine preconcentration and following determination. Because of its hydrophobicity, molecular iodine was quantitatively extracted from solution at a contact with the disks of polyurethane foam. The amount of colored analyte that was affixed on the portion of the disk was then determined by diffuse reflectance spectroscopy.

2. Iodate preconcentration and following determination. It is known, that the mixture of iodate and the excess amount of iodide is extremely stable in solution. By the addition of acid this system produces quantitatively iodine equivalent to the iodate, according to the following equation: $\text{I}_3^- + 5\text{I}^- + 6\text{H}^+ \leftrightarrow 3\text{I}_2 + 3\text{H}_2\text{O}$.

Therefore for preconcentration and following determination of iodate the solution was acidified and added excess of iodide. An iodine appeared in an amount which was equivalent maintenance of iodate. Iodine which appeared, further determined as in a point 1.

3. Sum of iodide and iodate at their joint presence preconcentration and following determination. Iodide oxidized bromine water to iodate:

$$\text{I}^- + 3\text{Br}_2 + 3\text{H}_2\text{O} \leftrightarrow \text{I}_3^- + 6\text{Br}^- + 6\text{H}^+.$$  

Excess of bromine was deleted by water solution of phenol: $2\text{Br}_2 + \text{C}_6\text{H}_5\text{OH} \leftrightarrow \text{C}_6\text{H}_3\text{Br}_2\text{OH} + 2\text{HBr}$ and further operated as in points 2 and 1.

4. If it was necessary, maintenance of iodide was expected on a difference between maintenance of sum of iodide and of iodate (point 3) and maintenance of iodate (point 2).