

Abstract

The presented thesis deals with finding the optimal experimental setup for the chemiluminescent determination of cobalt ions by the technique of flow injection analysis (FIA) and sequential injection analysis (SIA) and comparing the achieved results of the determination.

The determination is based on a chemiluminescent reaction, essence of which is oxidation of luminol with hydrogen peroxide in an alkaline solution in a flow system in the presence of cobalt ions, which acts as a catalyst of the reaction.

In the experimental part of the work, a suitable setup for the detection of chemiluminescent light emission was found, followed by a suitable setup of the FIA and SIA systems for the determination of cobalt ions. For the detection of radiation, a glass spiral tube was selected, which was the most suitable for chemiluminescent measurement, compared to other experiments performed with different.

In the next part of the work, optimal conditions for cobalt ions determination were experimentally found. As for the FIA technique, the volume flow rate of hydrogen peroxide, luminol and cobalt ions solutions was optimized. Furthermore, the concentration of the hydrogen peroxide solution and luminol. Last but not least, the dosing volume of the cobalt ions solution and the pH of the luminol solution were optimized. For the SIA technique, the parameters were optimized based on changes in the setup of the SIA apparatus. The dosing volume of the cobalt ions solution, the volume flow rate of the pump, the volume flow rate of the cobalt ions solution, the dosing volumes of the reagents and the volume flow rate of the hydrogen peroxide solution were optimized. Furthermore, the catalytic ability of selected ions (Ni^{2+} , Fe^{2+} , Mn^{2+} , Zn^{2+} , Cd^{2+} , Cr^{3+} , Ag^+ , Cu^{2+} , Al^{3+}), which could affect the intensity of chemiluminescent radiation, was studied.

At the end of the work, under the optimized conditions, the basic characteristics of the determination for cobalt ions by FIA and SIA methods were determined. Subsequently, these characteristics were compared for both methods. Above all emphasis was placed on the limit of detection and sensitivity achieved.

Keywords

Flow injection analysis, sequential injection analysis, chemiluminescence, luminol, cobalt ions