A novel approach to chloride determination using a lab-on-valve flow system

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Application of flow-based systems in analyses proves to be advantageous due to the reduction of sample and reagent consumption as well as waste production, and consequently, the decrease the costs of analyses. Moreover, the ease of mechanization contributes to the increase in the efficiency of analyses and makes it possible to limit sample contamination and minimize the contact of an analyst with toxic reagents. Finally, the implementation of methods in flow systems, can contribute to the improvement of precision and accuracy of analytical results. The use of flow-through techniques is justified especially when performing routine analyzes.

Chlorides are one of the main ions that are needed for the proper functioning of our body in relatively larger amounts and chloride is the most important extracellular anion. Chloride maintains osmotic pressure, muscle activity, acid-base balance, and fluid movement between fluid compartments. Chloride is an important component of diagnostic tests in many clinical situations. A high concentration of chlorides in urine combined with other symptoms allows for the diagnosis of the disease [1]. Although some foods, including tomatoes, olives and seaweed, are high in natural chlorides, generally chloride is added to food products in the form of sodium chloride during processing in factories or when consumers season them with table salt. Excessive salt consumption causes health problems, so its content in food products is usually subject to specific regulations. The chloride ions content is correlated with the salt content, so their determination allows to monitor the salt level and control the quality of table salt as well as other food products.

The research was concentrated on developing a highly efficient method with the use of a lab-on-valve flow system enabling the routine monitoring concentration of chloride. The proposed method is based on the use of chloride as a catalyst for the oxidation reaction of 3,3′,5,5′-tetramethylbenzidine-H_2O_2 system triggered by copper ions. During the research, the best instrumental conditions for the flow system and the reaction were selected, as well as the analytical parameters of the method were evaluated. The obtained linearity range and the value of the limit of quantification allow us to conclude that the proposed method may be useful for determining chloride ions both in samples of food products (e.g. table salt, spices) and in human urine.

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