Solid-phase extraction of synthetic dyes from wastewater and their analysis by HPLC

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The analysis of synthetic dyes in wastewater is an urgent task of modern analytical chemistry, since an increased content of dyes in wastewater can have a negative impact on the environment. To monitor the content of dyes in various objects, reverse-phase high-performance liquid chromatography (RP HPLC) is often used, which allows one to reliably determine the content of substances of interest.

The purpose of this work was to create and evaluate the metrological characteristics of a method for analyzing synthetic dyes in wastewater from enterprises with a high content of inorganic salts. The chromatographic system used in this work consisted of a high-pressure pump manufactured by Knauer, separation was carried out on a Kromasil 100-5-C18(w) reverse-phase column (4.6 × 250 mm) in gradient elution mode. Acetonitrile and ammonium acetate solution were used as the mobile phase. Detection of synthetic dyes was carried out using an Azura diode array detector.

The paper presents the results of concentrating 10 synthetic dyes on commercially available solid-phase extraction cartridges, which are suitable for working with aqueous solutions with a high content of inorganic salts. For each substance, the degree of concentration from distilled and model wastewater was calculated, which varies from 2 to 98%. The highest degree of concentration of the analyzed cartridges when operating in conditions close to real wastewater was shown by the “Diapak P” cartridge, with a pH of the concentrated solution equal to 4. Based on the results of this work, a method for the simultaneous determination of 10 synthetic food colors (SFC) (E102, E104, E110, E122, E124, E129, E131, E133, E142, E151) in aqueous and organic solutions.

The results of the work may be useful in the field of analytical monitoring of the content of synthetic dyes in wastewater from enterprises. The intermediate precision limit of the technique did not exceed 5%, and the expanded measurement uncertainty was less than 10%.