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The use of solid-phase extraction for the concentrating of synthetic food dyes

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Abstract

The final data on the application of solid phase extraction (SPE) as the most commonly used method of extraction and concentrating of more than 40 synthetic dyes (SD) from a wide variety of food products have been generalized and considered. Furthermore the SD are ranked according to the degree of use in the food industry. It is noted that the most sophisticated matrices represent food containing proteins, carbohydrates and fats. There are few Russian state standards (GOST) developed for a number of SD in alcoholic beverages, candies, spices, based on SPE. The basic steps of SD concentrating using SPE consist of column conditioning, addition the sample solution to the column (e.g. beverage, extractor), washing the column with the solvent, elution the target component. The solid samples are dissolved in water before extraction step, the samples of effervescent beverages are devolatilized if necessary, adjusting the pH of solutions to 4.5. Extraction of the synthetic food dyes is mostly carried out by means of polymeric sorbents based on polyamide (powders or cartridges) which are allowed to concentrate almost all the SD permitted for use. It has been outlined the usage of polymers based on divinylbenzene and *N*-vinylpyrrolidone (HLB cartridge), methacrylic ester copolymer (Diaion HP 2MG), polyurethane, Sephadex DEAE A-25, molecular imprinted polymers in the several articles. It was found that chemically modified silica is rarely used in SPE cartridges (C18 Sep-Pak). A number of papers mentioned applying of the natural white wool which adsorbs dyes in acetic acid medium. GOST recommends alumina cartridges to be used for extraction methods. In the most cases desorption process is carried out by the ammonia solutions, methanol or mixtures thereof as well as ethanol-ammonia solutions which are removed by evaporation before SD quantification. The most common detection methods of SD are valuated such as chromatography (HPLC different options, TLC) and spectrophotometry unlike the capillary electrophoresis which is less used and electrochemical methods which are virtually not employed. SPE has been mostly applied for the extraction of the SD from various drinks, candy, jelly, juice concentrates, more rarely from syrups, jellies, ice cream, jam, chewing gum, sauces and some fish products. Some examples of SPE of SD from beverages and confectionery, followed by quantification have been reviewed. The outlook of the SPE in comparison with other extraction methods is presented.

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