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Application of liquid-liquid extraction for the synthetic dyes determination in food products

© **Nataliya B. Shestopalova**, **Rimma K. Chernova**,*[2] and **Sergey Yu. Doronin**[+]
[1] *Saratov State Medical University named after V. I. Razumovsky, Department of General, Bioorganic and Pharmaceutical Chemistry. Bolshaya Kazachia St., 112. Saratov, 410012. Russia. Phone: +7 (845-2) 66-98-50. E-mail: shestopalovanb@yandex.ru*
[2] *Department of Analytical Chemistry and Chemical Ecology. Institute of Chemistry. Saratov State University. Astrahanskaya St.,18/3. Saratov, 410012. Russia. Phone: +7 (8452) 26-45-53. E-mail: Doroninsu@mail.ru.*

*Supervising author; [+]Corresponding author

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Abstract

The final data on the use of liquid-liquid extraction for the concentrating of 14 synthetic food dyes (SFD) from food products (soft drinks and their concentrates, jelly powders, jelly, caramel, candies, jams, gelatin desserts, yoghurts), pharmaceutical preparations and others were summarized and analyzed. It was shown that, acetone and its mixtures with isopropanol and dioxane in combination with salting out agent ($(NH_4)_2SO_4$) as extractants are used, mainly, for the classical SPK extraction. Modern methods of concentrating SFD based on the use of dilute aqueous solutions of surfactants (S, "cloud point extraction" methodology) are given special attention. The small volume of the micellar phase formed, the high distribution coefficients of the extracted substances, the rapid phase separation, availability, cheapness, low toxicity and incombustibility of surfactants are the advantages of this methodology. It is shown that, non-ionic surfactants (NS) are mainly used as extractants: polyoxyethylated alkylphenols (Triton X-100, Triton X-114), their industrial analogs (OP-7, OP-10) in the presence of strong electrolytes, salting out agents (chlorides, sulfates, phosphates of alkali metals, ammonium, etc.). The possibility of use of other NS micellar phases was studied using oxyethylated derivatives of alkylphenols, alcohols, amides, esters, block copolymers of ethylene oxide and propylene oxide for the extraction of SFD. The values of the turbidity temperatures in the systems NS – H_2O are determined experimentally. The values of the distribution coefficients and degrees of extraction of the NS micellar phases for azorubin and bromothymol blue were calculated. Their comparative characteristics are given. Examples of 60 synthetic dyes of different classes show the universal extractive ability of NS micellar phases. The influence of the charge of SFD ionic forms on the extraction parameters of monoazo compounds forming single, double and triply charged anions was studied. It was shown that, for monoazo compounds with the same degree of hydrophobicity containing from 1 to 3 sulfo groups, a decrease in the degree of extraction is observed in proportion to the anion charge increase from 98.2% to 76.5% and from 83.7 to 44.1%, respectively.

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