

s, meso-H); 5.78 (2H, broad unresolved m, MeCH); 5.65 and 5.63 (two d, $J = 7$ Hz) and 5.64 and 5.59 (two d, $J = 11$ Hz) (2H, CHAc₂); 4.71 and 3.30 (8H, two t, CH₂CH₂COO); 4.01, 4.0, 3.97, 3.96, 3.87, 3.80 (12H, all s, ring CH); 3.81 and 3.77 (6H, two s, COOCH₃); 2.18, 2.11, 2.05 (6H, all d, $J = 6$ Hz, side chain CH₃); 2.90, 2.89, 2.88, 2.05, 2.03, 1.96, 1.92 (12H, s, 6H, COCH₃).

The structure of porphyrin IV opens up completely new prospects for the synthesis of the most diverse and accessible compounds of series of 2,4-disubstituted derivatives of deuteroporphyrin-IX with the goal of their possible use in various areas of medicine.

LITERATURE CITED

1. G. V. Ponomarev, *Khim. Geterotsikl. Soedin.*, No. 7, 943 (1980).
2. G. V. Kirillova, T. A. Babushkina, G. V. Ponomarev, and V. G. Yashunskii, USSR Author's Certificate No. 857,138; *Byull. Izobret.*, No. 31, 115 (1981).

DINITROBENZOFURAZAN DERIVATIVES AS SELECTIVE REAGENTS FOR ORGANIC ANALYSIS

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Dinitro-substituted benzofurazans and their N-oxides are known as active electrophiles in reactions with amines [1].

We have observed the manifestation of high contrast of the spectral properties [2] ($\Delta\lambda_{\max}$, the shift of the maximum of the absorption band of the reaction product as compared with the absorption band of the corresponding reagent) in reactions of 5,7-dinitro-4-chlorobenzofurazan, 4,6-dinitro-7-chlorobenzofuroxan, and 4,6-dinitro-5-chlorobenzofurazan with aromatic amines with various degrees of substitution, hydrazides, and hydrazines. Primary amines react with the indicated compounds to give orange and red solutions or spots on TLC plates ($\lambda_{\max}$ 500-520 nm), while secondary and tertiary amines react to give green and blue solutions or spots ($\lambda_{\max}$ 580-670 nm). The reaction of dinitrobenzofurazan derivatives with aryl- and alkylhydrazines and hydrazides also leads to the formation of red ($\lambda_{\max}$ 500-520 nm) reaction products for the hydrazides and green and blue ($\lambda_{\max}$ 630-670 nm) products for the hydrazines. The intensities of the absorption bands of the reaction products (ϵ 22,000-30,000 at 510 nm and 12,000-18,000 at 650 nm) and the positions of the maxima of the charge-transfer bands are determined by the I and M effects of the substituents.

The high contrast of the electronic spectra of the products of the reaction of halodinitro-substituted benzofurazans and benzofuroxans with amines ($\Delta\lambda_{\max}$ reaches 250 nm) makes the indicated compounds effective and selective reagents for the analysis of the components of complex reaction mixtures by HPLC, TLC, and spectrophotometry. When the indicated compounds are used to detect spots in TLC, one can, from the color of the spots, visually evaluate the presence of amines with different degrees of substitution, hydrazides, and hydrazines in reaction mixtures. In some cases it is possible to visually evaluate the presence of substituents and even their position in the aromatic ring in the compound being subjected to the determination. This property of the reagents is important in the analysis of reaction mixtures containing compounds with close R_f values (antioxidants based on dihydroquinolines, some pharmaceutical preparations). The limit of detection of the amines reaches 0.05 μg (TLC) and $5 \cdot 10^{-7}$ mole/liter (photometry).

A dependence of the rate of the analytical reaction on the polarity and donor properties of the solvent, the I and M effects in the substrate, the basicities of the substances subjected to the determination, and the electrophilicity of the reagent is observed. An increase in the selectivity of the determinations is achieved when the indicated parameters are varied. Anomalous reactivity of 4,6-dinitro-7-chlorobenzofuroxan is observed in reactions with dihydroquinoline derivatives and some other secondary amines.

LITERATURE CITED

1. D. Barton and U. D. Ollis (eds.), *General Organic Chemistry* [Russian translation], Vol. 9, Mir, Moscow (1985), p. 527.
2. S. B. Savvin, *Usp. Khim.*, **54**, 1814 (1975).

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