APPLICATION OF SILVER METAL-POLYMER NANOCOMPOSITES IN THE ANALYSIS OF IODIDE IONS

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The aim of this work was to develop a method for the determination of iodide ions using reactive indicator paper (RIPs) modified with silver-containing nanocomposites.

Silver-containing nanocomposites were synthesized by thermolysis of unsaturated silver carboxylates in an inert atmosphere and characterized by elemental analysis, IR spectroscopy, XRD, SEM, and TEM.

It has been established that papers modified with nanocomposites are characterized by the presence of an intense SPR band in the diffuse reflection spectra, the amplitude of which is linearly related to their content in the samples.Working solutions of substances were prepared by dissolving their exact weights in distilled water. Iodide standard solutions (standardized by argentometric titration) were prepared by diluting appropriate aliquots of the stock standard solution immediately prior to use.

The reaction was carried out in a setup for dynamic gas extraction (Figure 1).

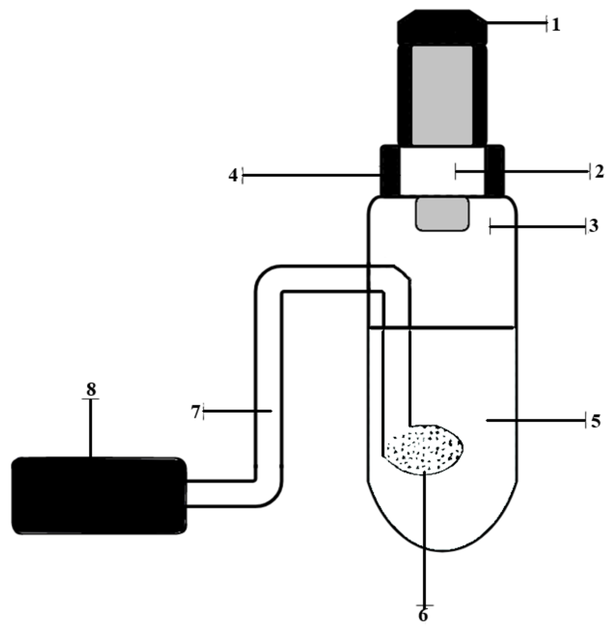
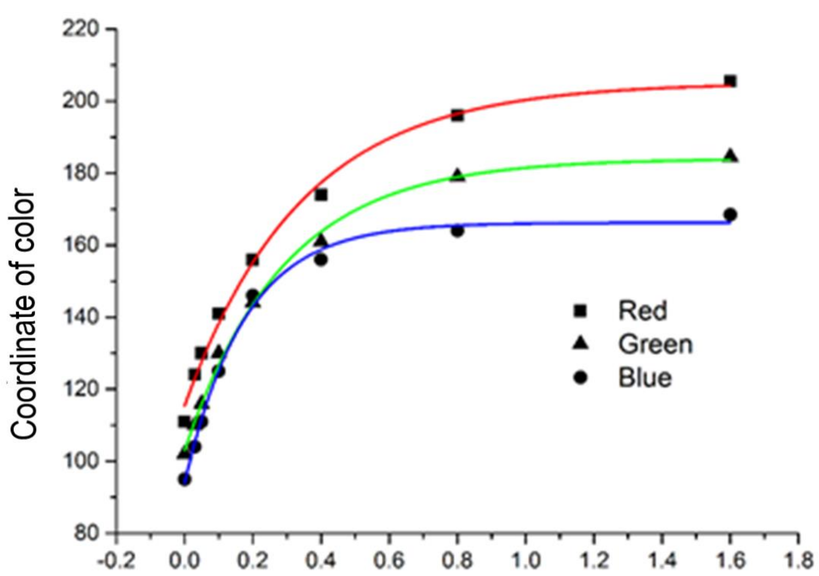


Fig. 1. Setup for dynamic gas extraction: 1 – rubber stopper; 2 – test strip; 3 – glass vessel for the analysed solution; 4 – holder of test strips; 5 – reaction mixture; 6 – glass bubbler; 7 – polymer hose; 8 – air microcompressor

The use of RIPs for the purposes of quantitative analysis with the registration of optical effects by colorimetry

Sensitive and selective methods for the determination of iodine and iodides with preliminary dynamic gas extraction have been developed. The intensity of the RIPs color change is proportional to the concentration of iodides in the solution:



Plots of R, G, and B color coordinates versus iodide concentration are described by the equations

$y = y_0 + A\,(1 - e^{-c/t})$

Scheme for the determination of iodides

$2Fe^{3+} + 2I^- \rightarrow I_2 + Fe^{2+}$ (In the presence of H_2SO_4) → Extraction iodine by air → $2Ag^0 + I_2 \rightarrow 2AgI$ → Indication

Reference scale

C (KI), mg/l	0.0	0.03	0.05	0.1	0.2	0.4	0.8	1.6
R	111	124	130	141	156	174	196	206
G	102	110	116	130	144	161	179	185
B	95	104	111	125	146	156	164	169

Advantages of the extraction-colorimetric method of determination:

Economy	Expressiveness
Availability	Selectivity
Wide scop	No sample preparation

Analytical characteristics of the method and interfering influence

Analyte	C_{min}, mg/l	Range of determined concentrations, mg/l	S_r
I_2	0,01	0,02–1,6	0,06
I^-	0,02	0,03–1,6	0,04

The determination of iodide ions and iodine is interfered with (in the high concentrations!): H_2O_2, CH_3COOH, CH_3COO^-, H_2S, S^{2-}.

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