Sorptsion-Photometric Determination of Lead (II) Ion from Mining Metallurgy Industry Waste Using Organic Reagent

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ABSTRACT

1,3,4-thiadiazole-2,5-dithiol organic reagent is used as analytical reagent for lead(II) ion. The possibility of their immobilization in fiber carriers and their use as a specific analytical reagent for the determination of metal ions, particularly lead (II) ion, has been developed. A simple, express method for the determination of lead (II) ion using 1,3,4-thiadiazole-2,5-dithiol organic reagent is shown. The reagent reacts with lead (II) ion in a ratio of 1:6.

Keywords: Nickel and cobalt ions, 1,3,4-thiadiazole-2,5-dithiol organic reagent, analytical reagent, immobilization, sorption-photometric determination, buffer reagent.

Actual problems of analytical chemistry lead to the development of industry and technology, poisoning of environmental objects, therefore, regular analysis of environmental objects, obtaining very pure substances in industry, and determining their content in one millionth percent.

There are different types of immobilization of organic reagents into a polymer matrix: electrostatic, adsorptive, and covalent immobilization. Immobilization increases the resistance of organic reagent layers to leaching and eliminates photochemical degradation. A standard method for preparing such immobilized substances is to achieve absorption at the matrix level of a reagent chosen according to the objective being observed.

Determination of Pb (II) ion by immobilization of organic reagent 1,3,4-thiadiazole-2,5-dithiol on polymethacrylate carrier. These methods in analytical chemistry focus on simultaneous concentration and detection. In this case, the formation of a complex with Pb (II) ion is evident.

Spectral characteristics of photometric determination of Pb (II) ion with PAN-GMDA are described. Ca2+, Mg2+, Cr3+, Al3+, Ni2+, Fe3+ interfere with this. A new photometric method for pharmacological chemistry has been developed.

Preparation of solutions

1. To prepare a working solution of 0.1% 1,3,4-thiadiazole-2,5-dithiol organic reagent, take 0.2 g of organic reagent on an analytical balance, put it in a 200 ml volumetric flask and bring it up to the mark with distilled water. The prepared solution was diluted and used for further work.

2. To prepare a standard 2 mg/ml solution of Pb +2 ion, take 0.5 g of (NH4)2SO4 * PbSO4·6H2O salt, put it in a 200 ml flask and bring it up to the mark with distilled water. This solution was used in subsequent work.

3. Concentrated sulfuric acid was diluted in preparation of 0.1 M sulfuric acid solution.
4. A 0.04 M (N2VO4, N3RO4, SN3SOON) 0.2 M NaOH solution was added to the universal buffer mixture with different pH (1–12).
5. For fiber preparation, 0.20 g of fibers synthesized in the department of polymer chemistry were taken and prepared for work.

Choosing a fiber carrier

Before preparing the above fibers for immobilization, 0.2 g of each of these fibers was taken and placed in separate 100 mL beakers and shaken in 0.1 M HCl solution for 10–15 min. The fiber was transferred to chlorine form. The fiber prepared for immobilization is kept moist in a Petri dish.

Prepared fibers were placed separately in a solution of 1,3,4-thiadiazole-2,5-dithiol organic reagent with a certain concentration, and the optical densities before and after immobilization of the reagent were measured. The results are presented in Table 1.

The results of immobilization of 1,3,4-thiadiazole-2,5-dithiol organic reagent on the fiber were washed with HCl and transferred to the form of anion exchanger Cl –, then washed with distilled water (repeated 2–3 times), and the fiber ready for immobilization was kept in a moist state.

Immobilization method: 10 ml of 0.1% 1,3,4-thiadiazole-2,5-dithiol organic reagent was poured into 50.0 ml measuring cups, 0.2000 g of fiber was added and

Mix with a glass rod for 5-8 minutes. Then the fiber was washed with distilled water and the amount of reagent absorbed into the fiber was measured, according to the results obtained in Table 1, PPA-1 fiber was selected.

Table 1

Results of immobilization of organic reagent 1,3,4-thiadiazole-2,5-dithiol on fiber

Tola	Aimmobillashgača	A immobillashdan sung	ΔA
SMA – 1	0,500	0,230	0,310
PPA-1	0,500	0,296	0,296
PAN - GMDA	0,500	0,389	0,105

Selection of optimal conditions for immobilization of 1,3,4-thiadiazole-2,5-dithiol organic reagent to fiber

To prepare immobilized carriers, 1,3,4-thiadiazole-2,5-dithiol organic reagent was immobilized on fibrous sorbent 1,3,4-thiadiazole-2,5-dithiol organic reagent. 1,3,4-thiadiazole-2,5-dithiol organic reagent is prepared for fiber immobilization before use. For this, 0.2000 g of the fiber carrier was washed with 50.0 ml of 0.1 M 1,3,4-thiadiazole-2,5-dithiol organic reagent immobilized on the fiber with HCl and transferred to the form of anion exchanger Cl-, followed by distilled water washed (repeat 2-3 times). Ready fiber for immobilization is stored in a wet state.

Immobilization method: 10 ml of 0.1% 1,3,4-thiadiazole-2,5-dithiol organic reagent was poured into 50.0 ml measuring cups, 0.20 g of fiber was added and

Mix with a glass rod for 7–10 minutes. The fiber was then washed with distilled water and the amount of reagent deposited on the fiber was measured, Table 1 and

Figure 1 shows the results.

Table 1

Dependence of the degree of immobilization of the organic reagent 1,3,4-thiadiazole-2,5-dithiol on the wavelength

Λ, нм	ΔA Reagent	ΔA Immobilized Reagent	ΔA Complex
360	0,24	0,17	0,05
400	0,33	0,23	0,06
440	0,29	0,18	0,045
490	0,25	0,14	0,045
590	0,19	0,10	0,08
660	0,11	0,08	0,101

730	0,089	0,05	0,05

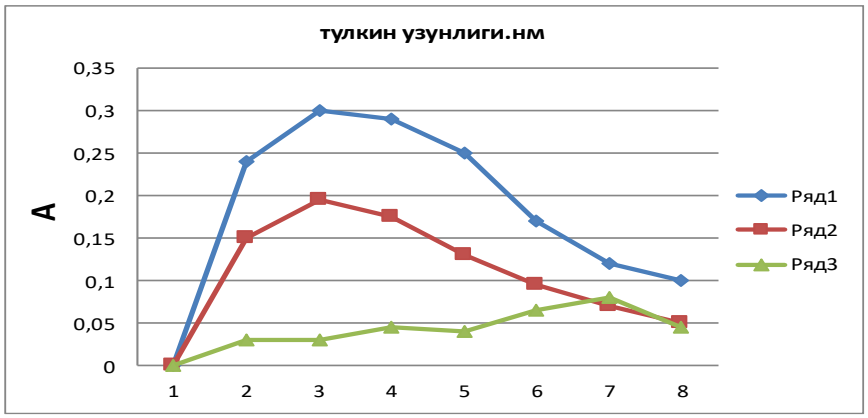

Figure 1. Absorption spectrum of 1,3,4-thiadiazole-2,5-dithiol organic reagent before (1) and after (2) immobilization, complex (3)

As can be concluded from the table, λmax = 440 nm for 1,3,4-thiadiazole-2,5-dithiol organic reagent, and λmax = 660 nm was observed when CMA-1 was immobilized. In this case, Δ λ = 220 nm is different due to complex formation.

References

1. Zolotov Yu.A., Kuzmin N.M., Neiman E.Ya., Popov A.A., Revalsky I.A. The concept of chemical-analytical control of environmental objects.// Russian chemical journal. 1993. T 77. No. 64. pp. 12-16.
2. Smanova Z.A. Sorption-photometric determination of copper on the surface of a polymer carrier. // Vestnik NUUz, Tashkent, 20110. №4. S. 124-127.
3. Mirzakhmedov R.M, Madusmanova N.K., Sorbtsion-photometric determination of rhenium metal in zr and pb cake // Innovative, educational, natural and social sciences, 2022, P. 663-669.
4. Ruzmetov U., Usmonaliev J. Study of some technogenic wastes of mining and metallurgical plants in Uzbekistan. O'zMU XABARLARI. 2023 3⍰1. Pages 407-411
5. Mirzakhmedov R M., Jumayev M N., Imomnazarova K A, Tursunbayeva A., Sorption-photometric determination of zinc ion from the composition of industrial cake of non-ferrous metallurgical enterprises // Scholar's Digest- Journal of Multidisciplinary Studies. 2023.4 No. 2. P 40-44.
6. Mirzakhmedov R.M., Madusmanova N.K., Sorbtsion-photometric determination of rhenium metal in zr and pb cake// Oriental Renaissance.2022 No. 2. P. 663-669.
7. Mirzakhmedov R.M., Madusmanova N.K., Smanova Z.A., Sorption-photometric determination of rhenium ion with an immobilized organic reagent // Central Asian Journal of Theoretical and Applied Science. 2021 No. 2. P. 89-93
8. Yakhshieva Z., Smanova Z., Khaydarov I., Mirzahmedov R. Amperometrical determination of palladium ions by organic azoreagents. // Austrian Journal of Technical and Natural Science. Austria. - 2017. No. 1-2. - P. 187-190.