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Research Article

SORPTION-SPECTROSCOPIC DETERMINATION OF LEAD AND ZINC IONS USING IMMOBILIZED SULFARSAZENE AZOREAGENT

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ABSTRACT

Today, the spread of toxic metals, which are considered anthropogenic pollution, causes a significant increase in environmental problems. Controlling the amount of heavy and toxic metals in the environment is an important ecological-analytical task.

KEYWORDS

Toxic metals, lead ions, zinc ions, immobilized carriers, optical spectroscopy, analytical reagents.

INTRODUCTION

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Among them, it is important to create selective, reproducible, sensitive modern methods of determining lead and zinc ions from environmental objects using analytical reagents. [1; pp. 1245-1250].

One of the main causes of environmental contamination with heavy metals, including lead, is due to their large-scale use in industry. The main sources of lead poisoning are as follows: lead is used in the mining of ores, in the fuel industry, in the production of paint, in printing houses, in the process of restoration of ancient paintings, in the production of batteries, in the glass industry, in the production of ceramics [2; p. 111].

Pollution of atmospheric air and water, soil objects, and the increase in REM remain a high level of danger to the health of the population, especially children, living mainly along major highways and around industrial facilities. Lead enters the human body through the skin and air through the respiratory system. Lead is mainly used in the form of PbO, $PbSO_4$, $Pb(CH_3COO)_2$ $(C_2H_5)_4Pb$ (tetraethyl lead) [3; pp. 846-848].

Lead enters the body mainly with food and water. It is mainly found in the highest concentration in the oral cavity and teeth. Lead taken orally is absorbed into the intestines, reaches the liver, and from there it is returned with bile to the intestine and duodenum. Part of the lead is reabsorbed and the rest is exhaled. Lead enters the bloodstream through the respiratory system and reaches its maximum concentration. Lead is excreted through the kidneys, and part of it is absorbed into the bones. Lead inhibits iron and enzymes in the blood. Lead entering the body forms a complex with carboxyl, sulfhydryl, imidazole, and phosphate ions [3; pp. 154-158].

For the preparation of immobilized carriers, the fiber sorbents selected and converted to chlorine form were immobilized on SMA-1-hexamethylenediamine-modified polyacrylonitrile fiber, PPA-1 - polyethylene polyamine-modified polyacrylonitrile fiber on sulfarsazen reagent. In order to immobilize sulfarsazen on the fiber, the fiber is prepared before use. For this purpose, 0.2000 g of fiber carrier was placed in a 50.0 ml beaker, kept in 0.1 M HCl for 4-5 hours, washed 2-3 times with distilled water until it became neutral, and converted to anion-exchanger-Cl- form. The ready-made fiber for immobilization was stored in a moist state. 10 ml of a 0.01M solution of sulfarzazene reagent was added to the prepared fiber for obtaining the light absorption spectrum of the complexes, 10 ml of a buffer solution of 2 mg/ml metal solutions and distilled water were added to the line, and the analytical signal was controlled by mixing. [4; pp. 6-11].

Materials and Methods: Reagents and equipment. Chemically pure reagents were used in this work. and ch.d.a. The purity of the reagent was checked by ascending chromatography on paper.

Chemically pure organic solvents were used. or pre-purified by distillation, purity was controlled by boiling point.

The acidity of solutions was controlled with a glass electrode on a KSL-1100-1 pH meter

The spectra of micro and macroelements were taken on a PerkinElmer (USA) optics of inductively coupled argon plasma emission spectrometry (ICP OES) Optima 2100 DV with an S-10 autosampler, at emission wavelengths of 165-800 nm.

Methods used for the quantitative determination of micro and macroelements: 0.5000-0.0500 g of the test substance is weighed on an analytical balance and

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transferred to Teflon autoclaves. Then the autoclaves are filled with 3 ml of concentrated nitric acid (reagent grade) and 2 ml of hydrogen peroxide (reagent grade).

Result and Discussion: Immobilization method: 10 ml of 0.1% sulfarzazene reagents were placed in 50.0 ml measuring cups. 0.2000 g of fiber was added and mixed with a glass rod for 4-5 minutes. The fiber was then washed with distilled water and the amount of reagent deposited on the fiber was measured. The optical densities of the reagents were measured before and after carrier loading in the EMC-30PC-UV Spectrophotometer, the wavelength corresponding to the maximum of the reagent, the results are presented in Table 1 and Figure 1.

Table 1

Optimum conditions and spectral characteristics of sulfarzazen reagent, immobilized sulfarzazen, complex of immobilized reagent with Zn2+ and Pb2+ ions

PPA 1					
R	SAA reagent	IMR+Zn	IMR+Pb	$\Delta\lambda_{Zn}$	$\Delta\lambda_{Pb}$
315-750	420	520	540	100	120
Buffer solution Lemon + ammonia (pH)	8-10	8-10	8-10		
Time, (4-5 min)	0,40	0,44	0,48		
Effect of pouring procedure on immobilization		Fiber+R+Me+ buffer	Fiber+R+buffer +Me		
SMA1					
R	SAA reagent	IMR+Zn	IMR+Pb	$\Delta\lambda_{Zn}$	$\Delta\lambda_{Pb}$
315-750	420	560	580	120	140
Buffer solution Lemon + ammonia (pH)	8-10	8-10	8-10		
Time, (4-5 min)	0,32	0,34	0,36		
Effect of pouring procedure on immobilization		Fiber+R+Me+ buffer	Fiber+R+buffer +Me		

Sulfarzazen reagent showed an absorption spectrum of 420 nm. The maximum light absorption spectrum of the complex formed by sulfarzazen reagent with PPA1 sorbent and Zn2+ ion was observed at 520 nm, and the maximum light absorption spectrum of sulfarzazen reagent formed with PPA-1 sorbent and Pb2+ ion was observed at 540 nm. The maximum light absorption spectrum of the complex formed by sulfarzazen reagent, SMA-1 sorbent and Zn2+ ion was observed at

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560 nm, and the maximum light absorption spectrum was observed at 580 nm.

In conclusion, it can be noted that the reagent absorption maximum was observed at 420 nm. For zinc ions - 560 nm, for lead ions - 580 nm, the maximum of the light absorption spectrum was irradiated, and in the following works it was carried out at this wavelength.

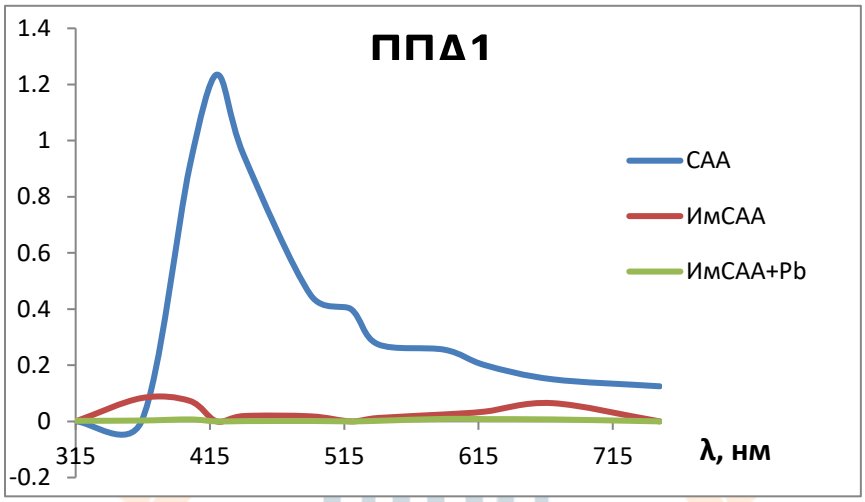

Fig. 1. Graph of optical density of immobilization of lead (II) ion on PPA1 fiber as a function of wavelength.

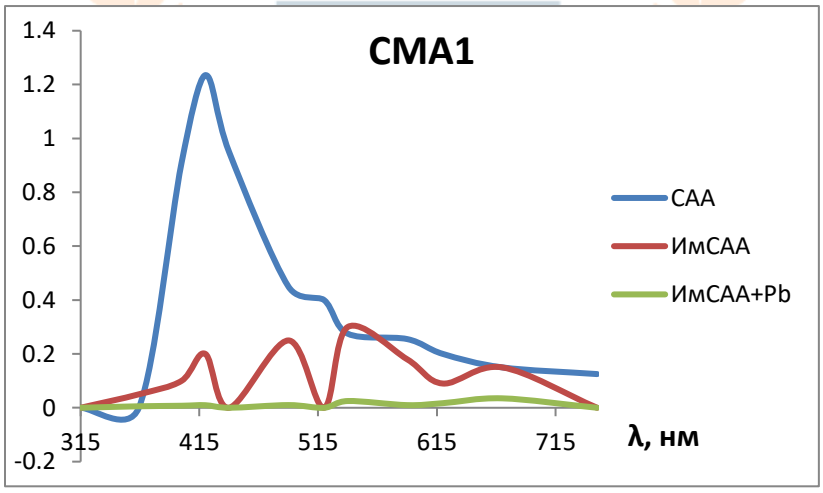

Fig. 2. Graph of optical density of immobilization of lead (II) ion on SMA1 fiber as a function of wavelength.

It can be seen from the above pictures and tables that it was observed that sulfarzazen reagent differs in complex compounds at a wavelength of 420 nm, PPA-1 sorbent by 100 nm, and SMA-1 sorbent at a wavelength of 140 nm. The maximum point of the level of immobilization was determined. Based on the obtained results, an immobilized reagent containing a sufficient amount of components when sorbed to a

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carrier in a neutral and weakly acidic environment was used as optimal conditions for use in further research.

Figure 3. Color changes of PPA-1 and SMA-1 fiber sorbents before and after immobilization.

CONCLUSIONS

Judging from the color changes, high color intensities were observed in the complex combination of polyacrylonitrile fiber modified with SMA-1-hexamethylenediamine and PPA-1 - polyacrylonitrile fiber modified with polyethylene polyamine with sulfarzazen azo reagent.

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