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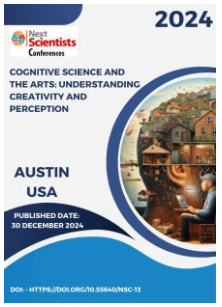

THE DETERMINATION OF IRON AND COBALT IONS USING ORGANIC REAGENTS IMMOBILIZED ON PPA-1 FIBROUS SORBENT

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ABSTRACT

In the scientific research, a sorption-spectrophotometric method for the determination of iron and cobalt ions using PPA-1 (Polyacrylonitrile + polyethylene diamine) sorbent with immobilized organic reagents has been proposed. The sequence of immobilization processes has been determined. Absorption spectra were obtained before and after immobilization.

KEYWORDS: Immobilization, PPA-1, methyl thymol blue, nitroso R salt, iron, cobalt, sorption-spectrophotometric.

INTRODUCTION

In today's world, the detection of heavy and toxic metals in environmental objects and their continuous monitoring is of great importance. Iron and cobalt metals also fall into two categories according to their toxicity levels.

In the scientific research, methods for sorption-photometric determination of iron and cobalt ions using organic reagents immobilized on PPA-1 fibrous sorbent have been developed. As organic reagents, methyl thymol blue (MTB) and nitroso-r salt (NRS) reagents were selected. The highest immobilization process for the selected reagents was observed on the PPA-1 sorbent. Spectra were obtained both before and after immobilization.

The immobilization process is carried out in three different forms:

1.Immobilization of active groups of organic reagents onto a fibrous carrier and subsequent metal detection:

- In this method, organic reagents are immobilized on the surface of the fiber, and then they are used to form complexes with metal ions. The analytical signal is obtained through the interaction between the sorbent and reagents.

2.Immobilization of metal ions onto a carrier with functional active groups, followed by the addition of an organic reagent to enhance selective interaction:

- In this method, metal ions are immobilized on the carrier (such as fiber or other materials), and then reagents are added, ensuring selective interaction with specific metals. The addition of the reagent ensures the formation of a stronger complex with the metal ions.

3.Formation of a complex between the reagent and metal ions in the liquid phase, followed by immobilization onto a polymer sorbent to enhance its stability:

- In this method, a complex is first formed between the reagent and metal ions, and then this complex is immobilized onto the surface of the polymer sorbent. This method helps to increase the stability of the complex and improve the analytical properties of the final complex.

Based on the analysis of the results, the second-order arrangement of components was chosen for the immobilization process.[1]

Table-1

Types of component immobilization order

№	Types of immobilization process orders.	ΔA MTB+ Fe^{3+}	ΔA NRS+Co^{2+}
1	PPA-1+Me+R	1,958	2,323
2	**PPA-1 +R+Me**	2,523	3.220
3	Complex+PPA-1	1,756	2,120

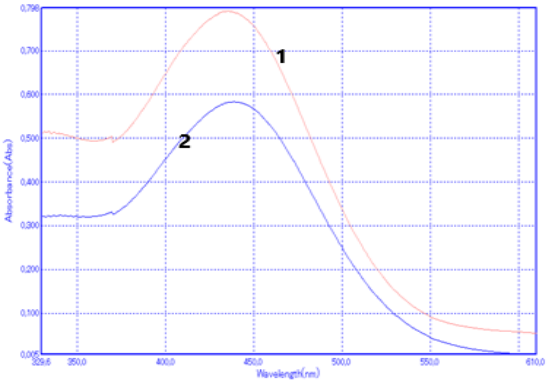

Figure 1. Absorption spectra of the methyl thymol blue reagent solutions before (1) and after (2) immobilization with PPA-1 fiber.

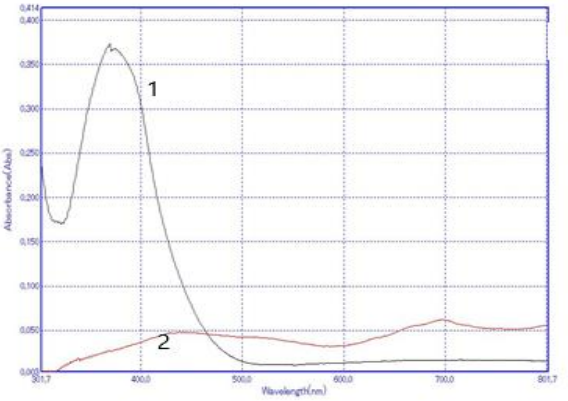

Figure 2. Absorption spectra of nitroso-r salt reagent solutions before (1) and after (2) immobilization with PPA-1 fiber.

The determination of iron and cobalt ions using methyl thymol blue and nitroso-r salt organic reagents immobilized on PPA-1 fibrous sorbent has been studied in terms of its compliance with the Beer-Lambert law. The results showed that the calibration curve for iron and methyl thymol blue reagent ranged from 10-100 μg/ml, while for cobalt and nitroso-r salt reagent, it ranged from 6-60 μg/ml. These results demonstrate that the method is effective in terms of accuracy and sensitivity.[2]

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