

## Synthesis and Characterization of Mixed-Ligand Complexes of Arsenic-Organic Compounds

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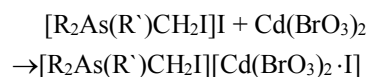
**ABSTRACT.** Unlike the other coordination compounds, one of the most important features of the tetrasubstituted arsonium salts is their tendency to produce cationic and anionic complexes in alcohol-water solution. The mixed-ligand complexes have great prospects of application. Most likely, these compounds have high and specific biological activity. The arsonium salt and cadmium bromate are used as initial materials of reaction in the molar ratio of 1:1. The reaction is carried out at room temperature in alcohol-water solution. The structure and composition of synthesized mixed-ligand complexes of arsenic organic compounds were tested with elemental analysis and other physical and chemical methods of research. © 2018 Bull. Georg. Natl. Acad. Sci.

**Key words:** arsenic-organic compounds, bioactivity,  $d^{10}$ -elements, bromate

Nowadays, in the arsenic-organic chemistry the priority direction is to use arsonium salts for obtaining the coordination compounds [1-4]. As is known,  $d^{10}$ -elements are capable to produce coordination compounds with arsonium salts providing corresponding acido complexes of various structure and composition. The goal of the present work is to study the interaction of arsonium salts with cadmium bromate (V), to isolate the reaction products in the individual condition, to determine chemical composition and to study the chemical and physical properties and structure.

The iodides and cadmium bromate (V) of iodonemethylenetrialkyl(aryl)arsonium were used

as initial products. Soon after interaction of the reacting substances a whitish crystalline substance precipitated, and the goal was achieved according to equation [5-8]:



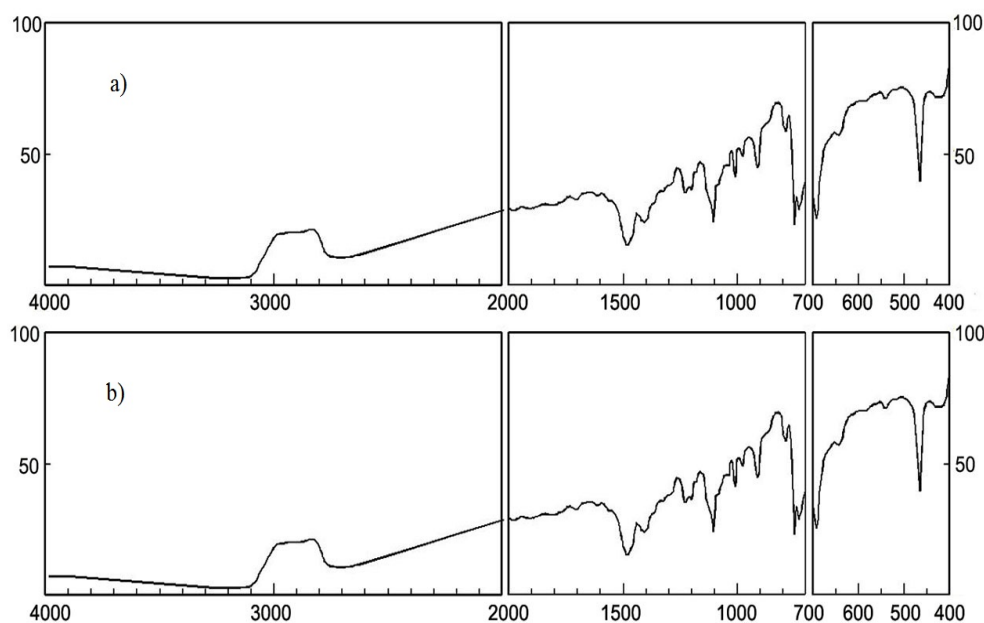
### Results and Discussion

Composition and structure of synthesized complexes are also confirmed by their electric conductivity. Since their  $\mu$  in the dimethylformamide (synthetic compounds do not solve in water, alcohol and other aprotic solvents) fluctuate within 75-93  $\text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$  (Table 1)

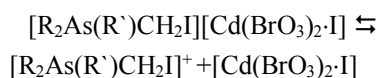
**Table 1.**

Some physical and chemical constants of iodide-bromate-cadmiums (II) of tetra substituted arsonium

#	[R <sub>2</sub> As(R')CH <sub>2</sub> I] [Cd(BrO <sub>3</sub> ) <sub>2</sub> ·I]		Melting temperature t, °C	μ, molar electroconductivity, om <sup>-1</sup> cm <sup>2</sup> · mol <sup>-1</sup>	Was found, %			Bruto- formula	Calculated, %		
	R	R'			As	Cd	Hlg		As	Cd	Hlg
1	C <sub>3</sub> H <sub>7</sub>	C <sub>3</sub> H <sub>7</sub>	224-225	92.1	8.61	13.28	47.95	C <sub>10</sub> H <sub>23</sub> AsCdBr <sub>2</sub> I <sub>2</sub> O <sub>6</sub>	8.73	13.0	48.22
2	izo-C <sub>3</sub> H <sub>7</sub>	izo-C <sub>3</sub> H <sub>7</sub>	197-198	90.4	8.85	12.83	48.02	C <sub>10</sub> H <sub>23</sub> AsCdBr <sub>2</sub> I <sub>2</sub> O <sub>6</sub>	8.73	13.0	48.22
3	C <sub>4</sub> H <sub>9</sub>	C <sub>6</sub> H <sub>5</sub>	73-74	87.8	8.38	12.01	45.39	C <sub>15</sub> H <sub>25</sub> AsCdI <sub>2</sub> Br <sub>2</sub> O <sub>6</sub>	8.14	12.21	44.98
4	izo-C <sub>4</sub> H <sub>9</sub>	izo-C <sub>4</sub> H <sub>9</sub>	183-184	77.6	8.30	12.61	47.75	C <sub>13</sub> H <sub>29</sub> AsCdI <sub>2</sub> Br <sub>2</sub> O <sub>6</sub>	8.32	12.48	45.97
5	C <sub>6</sub> H <sub>5</sub>	C <sub>6</sub> H <sub>5</sub>	139-140	75.2	7.98	11.55	42.92	C <sub>19</sub> H <sub>17</sub> AsCdI <sub>2</sub> Br <sub>2</sub> O <sub>6</sub>	7.80	11.70	43.10

**Fig. 1.** IR spectrum of absorption in the Vaseline oil: a) [(C<sub>3</sub>H<sub>7</sub>)<sub>3</sub>AsCH<sub>2</sub>I][Cd(BrO<sub>3</sub>)<sub>2</sub>·I]; b) [(C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>As(C<sub>6</sub>H<sub>5</sub>)CH<sub>2</sub>I][Cd(BrO<sub>3</sub>)<sub>2</sub>·I].

indicating that the study samples represent binary ionic coordination compounds that are dissociated in the dimethylformamide according to the following scheme: [9]:



The analysis of the absorption IR spectrum shows that they have almost all the absorption lines that are characteristic of the tetrasubstituted arsonium iodides indicating the ionic structure of the synthesized compounds. The only difference is that there are observed absorption lines 428; 790;

810 cm<sup>-1</sup> that are characteristic of the bromate ions [10].

To illustrate the above said, we provide the IR spectra of iodidedibromatecadmiates (II) of iodine-methylenetripropylphenylarsonium (Fig. 1, a) and iodidedibromatecadmiates (II) of iodine-methylenetripropylarsonium (Fig. 1, b).

The thermostability of synthesized materials were studied by thermodynamic method. As an example, we provide the results of thermal decomposition of iodidedibromatecadmiates (II) of iodinemethylenetripropylarsonium (Fig. 2.). The



In the same way, the other iodide-bromate-cadmiums (II) of tetrasubstituted arsonium are obtained (Table 2). The substances used for

reaction and the yield of target products are given in Table 2, and the other physical and chemical constants in Table 1 and Table 3.

ორგანული ქიმია

## დარიშხანორგანული შერეულიგანდიანი კომპლექსების სინთეზი და გამოკვლევა

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ოთხზანაგვლებული არსონიუმის მარილების ერთ-ერთ უმნიშვნელოვანეს თვისებას, სხვა კოორდინაციული ნაერთებისაგან განსხვავებით, წარმოადგენს კატიონურ-ანიონური კომპლექსების წარმოქმნისადმი მიდრეკილება. კერძოდ, ისინი წარმოქმნიან სპირტ-წყალხსნარებში კატიონურ-ანიონურ კომპლექსებს. შერეულიგანდიან კომპლექსნაერთებს გამოყენების დიდი პერსპექტივა გააჩნია. სახელდობრ, არსებობს დიდი ალბათობა, რომ ამ ნაერთებს ჰქონდეთ მაღალი და სპეციფიკური ბიოლოგიური აქტივობა. საწყის სარეაქციო მასალად გამოიყენება არსონიუმის მარილი და კადმიუმის ბრომატი, მოლური თანაფარდობით 1:1. რეაქცია ტარდება ოთახის ტემპერატურაზე, სპირტ-წყალხსნარებში. სინთეზირებული დარიშხანორგანული შერეულიგანდიანი კომპლექსების აღნაგობა და შედგენილობა ტესტირებული იყო როგორც ელემენტური ანალიზით, ასევე კვლევის სხვა ფიზიკურ-ქიმიური მეთოდებითაც.

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