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ELECTROCHEMICAL METHOD FOR OBTAINING β -DIKETONATES OF METALS

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Annotation: The production and structural study of mixed ligand complexes is of particular interest. It should also be noted that the synergism of mixed ligand copper(II) compounds containing two bioactive ligands (salicylic, nicotinic and benzoic acids) in each complex is enhanced. The advantages of the electrochemical synthesis method — a small number of reagents, process controllability and environmental safety — confirmed the high efficiency of this method in obtaining these complexes. The resulting coordination compounds can be used in the future in the fields of catalysis, materials science and electrochemical technologies.
Keywords: benzoic (HBen) and pyridine (Py), rare earth metals, (salicylic (HSal), nicotine (HNic)

Introduction

The consideration of methods for obtaining β-diketonates of metals is a very complex and laborious task, on the one hand, due to the variety of described synthesis methods and the lack of their generally accepted classification, and on the other hand, due to the contradictory data in the literature. It should also be noted that the search for literary sources has certain difficulties, since a number of published works on this issue will soon celebrate their centenary (or perhaps have already celebrated). Therefore, this literature review does not attempt to fully and in detail cover a wide range of topics.

Purpose and objectives of the study

First of all, attention was paid to the 3d - and f - elements that form the basis. In order not to drown in the sea of \u200b\u200bnumerable publications on β-diketonates of metals and methods for their preparation, all currently known syntheses were considered from the point of view of the reactions underlying them. It is the chemistry of the methods that became the basis for the classification of methods in this review. Each known method for obtaining chelatocomplexes is illustrated with the most vivid examples.

The preparation of chelatocomplexes by direct interaction of zero-valent metals and ligands is quite general for acidic H-atom compounds [1]. The method is based on the reaction catalyzed by trace amounts of water or nitric acid [2]:

$$M^{\circ} + nHL \xrightarrow[N_2]{H_2O} ML_n + n/2\ H_2$$

Despite the wide possibilities for obtaining β-diketonates of metals, none of the above methods is optimal. As indicated above, negative reasons may include the formation of water during synthesis, the multi-stage and long duration of the process, the release of harmful by-products, and in some cases the need to work with hygroscopic and air-unstable reagents, for example, the need for special equipment when conducting mechanochemical synthesis.

Scientific innovation

The electrochemical method of obtaining chelatocomplexes does not have all the listed disadvantages. As is known, electrochemical synthesis is carried out by anodic dissolution of the metal in an anhydrous solvent medium containing β-diketone [3]. The general process of obtaining chelatocomplexes is carried out according to the following scheme:

ecathod $RCOCH_2COR` + e- = RCOCHCOR`- + ½ H_2$

anode $Mo – ne- = Mn+$

It is obvious that as a result of electrochemical synthesis, the formation of water is excluded, and as a result, hydrolysis of the target products is excluded. The process itself is considered environmentally friendly, since no harmful and aggressive substances are released. It should be noted that one of the advantages of this method of obtaining chelatocomplexes is the single-stage nature of the process, which does not require the use of special and scarce equipment for its implementation. The conditions for carrying out electrolysis do not include strict requirements for protection from atmospheric moisture.

The presence of such undeniable advantages of the method could not fail to attract the attention of syntheticists. The electrochemical method was used to obtain nickel acetylacetonate [4] and cobalt (II), iron (II) and nickel (II) [5] acetylacetonates. The preparation of a number of fluorinated β-diketonates of cadmium, as well as their adducts by electrolysis is described in [6]. Using the electrochemical synthesis method, the authors of [7] obtained aluminum, chromium and zirconium acetylacetonates. It should be noted that in the latter case, the authors show a high yield of the target product in terms of current. The use of electrolysis also turned out to be effective in obtaining compounds of uranium and thorium with different valences. For example, the work reported the preparation of tetravalent uranium acetylacetonate and thenoyl trifluoroacetonate [8]. A similar experiment in an oxidizing atmosphere led to the preparation of uranyl acetylacetonate, but it was not possible to obtain the corresponding complex with thenoyl trifluoroacetone. The work discusses the electrochemical preparation of yttrium acetylacetonate [7].

Practical significance

According to the literature, despite the undeniable advantages of the electrochemical method of obtaining complex compounds of metals, it is not widespread. At the same time, the application of this method is clearly visible from the point of view of optimizing the synthesis. This situation indicates the need for further systematic experimental studies to determine the possibility of using electrolysis to obtain β-diketonates of various metals.

Conclusion

In this work, the possibilities of electrochemical synthesis of mixed-ligand coordination complexes based on copper(II), iron(III) and neodymium(III) ions in the presence of carboxylic acids were studied. It was found that the electrochemical method effectively performs the process of complex formation of metal ions with carboxylic acids and additional ligands. As a result of the experiments, it was determined that the electrode potential, pH value of the solution medium, concentration of ligands and duration of electrolysis have a significant effect on the formation of complexes.

The conducted studies have shown the prospects for the electrochemical synthesis of heterometallic and mixed ligand coordination complexes based on carboxylic acids and have created a scientific basis for further in-depth research in this area.

References

1. Гарновский А.Д., Рябухин Ю.Н., Кужаров А.С. Прямой синтез координатсионних соединений из металлов в неводних средах //Координатсионная химия. -1984. -Т.10. -Но8. -Б.1011-1032.
2. Жоши К.С., Патҳак В.Н. Металлические хелаты фторированных 1,3-длкетонов и родственных соединений // Координ. Чем. ревиwес. -1977. -В.22. -н.1/2. -Б.37-122.
3. Томилов А.П., Черних И.Н., Каргин Ю.М. Электрохимия элементорганических соединений. -М.: Наука, 1985. -254 б.
4. Ҳугҳес W.Б., Фалей Д.Р. УС Патент Но3887441 (1975). Электрокимёвий усулда атсетилатсетонатлар синтези.
5. Леҳмкуҳл Ҳ., Эисенбач W. Электросйнтҳесес вон Алкоҳолатен унд Асетйласетонатес дес Эисенс, Кобалтс унд Нискелс // Лиебигс. Анн. Чем. 1975. -С. 672-691.
6. Бустос Л., Греен Ж.Ҳ., Ҳенчер Л.Ж. Тҳе элестрочемисал сйнтҳесис оф β-дикетонато комплехес оф садмиум (ИИ) анд тҳеи аддустс // Санада. Ж. Чем. -1983. В.6л. -н.9. -Б.2141-2146.
7. Гринберг Я.Х., Лазарев В.Б., Заверняев А.Ю. и др. Энталпии плавления атсетилатсетонатов алюминия (ИИИ), хрома (ИИИ), сиркония (ИВ) и синка (ИИ) // Журн. физ. химии. -1986. -Т.60. -М. -Б. 1044.
8. Матааса Л., Кумар Н. Туск Д.Л. Тҳе дирест элестрочемисал сйнтҳесис оф челате комплехес оф ураниум (ИВ) анд (ВИ) // Инорг. Чим. Аста. -1985. -В.109. Но1. п. 19-21.