



SYNTHESIS AND STRUCTURE OF THE COMPLEX COMPOUND OF COBALT(II) META- HYDROXYBENZOATE WITH ACETAMIDE

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ABSTRACT

This article presents the synthesis of a complex compound based on acetamide and cobalt(II) meta-hydroxybenzoate, as well as the methods used to determine its composition and structure.

Meta-hydroxybenzoic acid (3-hydroxybenzoic acid) is one of the biologically active compounds possessing a phenolic structure and a carboxyl group. In medicine, it is mainly used due to its antibacterial, antifungal, and antioxidant properties [1–3]. Acetamide, which is a representative of amides, is also a water-soluble member of the B-group vitamins and plays an important role in metabolic processes in the human body [4].

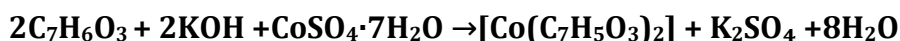
In the literature, several significant studies have been reported on the formation of complexes of Co(II) ions with ligands such as meta-hydroxybenzoate and nicotinamide. In addition, complexes of Ni(II), Cu(II), and Zn(II) ions based on acetamide and meta-hydroxybenzoate have been synthesized. These complexes were characterized using IR and UV-Vis spectroscopy, thermogravimetric analysis, and magnetic measurements. The results showed that each complex contains two water molecules, two meta-hydroxybenzoate ligands, and two nicotinamide ligands, all coordinated to the metal ion in a monodentate manner. The structures formed through this coordination are relatively stable, and distinct stages of thermal decomposition were clearly observed [5].

A deeper structural analysis was carried out by researchers. Based on crystallographic data, they determined the coordination environment of the cobalt(II) ion and proved that it adopts an octahedral geometry. The ligands are coordinated through oxygen and nitrogen donor atoms, and strong intramolecular hydrogen bonds were observed within the crystal

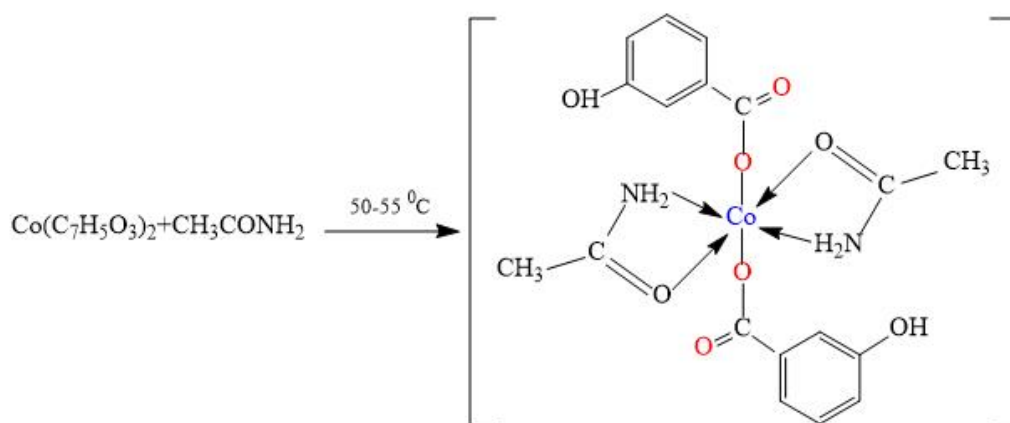
lattice. This further stabilizes the crystal structure and strengthens intermolecular interactions [6].

Methodology.

The synthesis of the complex compounds was carried out as follows: first, 0.1 g of meta-hydroxybenzoic acid was mixed with 50 mL of distilled water and gradually heated. After the acid was completely dissolved, 5 mL of 0.1 N KOH solution was added to the solution to create an alkaline medium. Then, 0.8 g of $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$ was dissolved in 20 mL of distilled water and added to the reaction mixture.



A clear solution was obtained, to which 0.2 g of acetamide dissolved in distilled water was slowly added. During the experiment, the solution gradually acquired a pale pink color, indicating the formation of a complex by Co(II) ions. With the addition of acetamide, the solution became more stable, suggesting that acetamide participated in the formation of the complex structure as a secondary ligand. This confirms the formation of a mixed-ligand coordination complex. The resulting solution was left at room temperature for 10 days, during which crystal growth was observed (Table 1).



The yield of the product was 86%. The elemental composition of the complex compound is as follows (Element – Calculated (%)/Found (%)): Co-8.90/8.85, C-46.83/46.75, H-4.11/4.60,

N- 8.46/8.30, O 31.40/31.10.

1-table

Name of the complex	Temperature 0C	Complex stability (control pH = 6–7)	Gross formula	Complex color	Yield level
$[\text{Co}(\text{C}_7\text{H}_5\text{O}_3)_2]$	30-40	High	$\text{CoC}_{14}\text{H}_{10}\text{O}_6$	Light pink	85–90%

$[\text{Co}(\text{C}_7\text{H}_5\text{O}_3)_2(\text{CH}_3\text{CONH}_2)_2]$	50-55	High	$\text{CoC}_{18}\text{H}_{20}\text{N}_2\text{O}_{10}$	Dark pink	80–85%
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Conclusion.

According to the results of the analysis, a complex compound based on Co(II) metahydroxybenzoate and acetamide was synthesized, and systematic analyses were conducted to determine its composition and structure. When choosing synthesis methods, the available literature was thoroughly studied and experiments from scientific sources were relied on. The synthesis of the complex compound was carried out in an aqueous solution environment, the obtained product was purified and dried and prepared for further analysis. The elemental composition of the resulting compound was evaluated by comparing it with the data obtained on the basis of theoretical calculations, and their high agreement was found, and the formula of the compound was experimentally confirmed..

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