

# COORDINATION COMPOUNDS BASED ON MAGNESIUM NITRATE

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**Abstract:** the complex compounds of magnesium nitrate with formamide, acetamide and nitro carbamide have been synthesized in this article. The composition, individuality, ways of formamide molecule coordination, acetamide, nitro carbamide and nitrate fragment were found. Methods of organic ligands coordination by surround of central ion and thermic behaviour of synthesized compounds were proved by oscillation spectroscopy and thermic analyses. Comparison interplanar space and relative intensity of magnesium nitrate, acetamide, formamide, nitro carbamide and coordination compounds  $Mg(NO_3)_2 \cdot HCONH_2 \cdot CH_3CONH_2 \cdot 2H_2O$ ,  $Mg(NO_3)_2 \cdot HCONH_2 \cdot H_2NCONHNO_2 \cdot 1.5H_2O$  presented that novel coordination compounds were differenced considerably each other and on homothetic them initial compounds. Therefore, synthesized complexes of magnesium nitrate have individual crystalline lattice were identified by IR-spectrum.

**Keywords:** complex compounds, composition, synthesis, technique, IR-spectrum, adsorption, X-ray analyses, thermolysis.

## КООРДИНАЦИОННЫЕ СОЕДИНЕНИЯ НА ОСНОВЕ НИТРАТА МАГНИЯ

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**Аннотация:** синтезированы комплексные соединения нитрата магния с формамидом, ацетамидом и нитрокарбамидом. Установлены состав, индивидуальность, способы координации молекул формамида, ацетамида, нитрокарбамида и нитратного фрагмента. Методами колебательной спектроскопии и термического анализа доказаны способы координации органических лигандов, окружение центрального иона и термическое поведение синтезированных соединений. Методом ИК-спектроскопии идентифицированы межплоскостные расстояния и относительные интенсивностей гексагидрата нитрата магния, ацетамида, формамида, нитрокарбамида и координационных соединений составов  $Mg(NO_3)_2 \cdot HCONH_2 \cdot CH_3CONH_2 \cdot 2H_2O$ ,  $Mg(NO_3)_2 \cdot HCONH_2 \cdot H_2NCONHNO_2 \cdot 1.5H_2O$  показало, что новые координационные соединения существенно различаются между собой и отличаются от подобных им исходных соединений. Следовательно, синтезированные комплексы нитрата магния имеют индивидуальные кристаллические решётки.

**Ключевые слова:** комплексные соединения, состав, синтез, методы анализов, ИК-спектры поглощения, рентгенофазовый анализ, термолиз.

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Mixed ligand compounds are used widely in medicine and agriculture. The latter needs novel chemical compounds possessing effective properties for growth of plants. Particular interest of these complexes is mixed ligand compounds of metals with vitamins that present by themselves novel class biological active compounds. Numerous studies on investigations of coordination compounds p, d, and f- metals with amide acids were devoted complexes with homogeneous ligands. In the beginning our researches there were no data on mixed ligand coordination compounds of metals nitrate. Some causes of competitive ligands, nitrate anion and water molecule of surround of central atoms were not presented. To solve these problems magnesium nitrate was elected by as complex former.

It is known that formamide, acetamide, nitro carbamide were used as organic ligands [1, 2]. For synthesis of coordination compounds mechanochemical technique was elected. Advantage of mechanochemical technique is not using deficient organic solvents and allows to synthesis complexes various composition with large outlet for short time. To establish individuality of synthesized compounds IR-spectrum adsorption was recorded in a range 400-4000  $cm^{-1}$  on spectrometer IRTracer-100 (Shimadzu, Japan).

Complex  $\text{Mg}(\text{NO}_3)_2 \cdot \text{HCONH}_2 \cdot \text{CH}_3\text{CONH}_2 \cdot 2\text{H}_2\text{O}$  was synthesized by intensive mixing 1.28 g (0.005 mole)  $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  with 0.225 g (0.005 mole) formamide and 0.295 g (0.005 mole) acetamide in agate mortar in 3 hours. Yield constituted 96.54%. Compound  $\text{Mg}(\text{NO}_3)_2 \cdot \text{HCONH}_2 \cdot \text{H}_2\text{NCONHNO}_2 \cdot 1.5\text{H}_2\text{O}$  was synthesized intensive mixing 1.28 g (0.005 mole) magnesium nitrate with 0.225 g (0.005 mole) formamide and 0.525 g (0.005 mole) nitrate carbamide in agate mortar under room temperature in 3 hours. Product's outlet was 95.10%.

Comparison interplanar space and relative intensity of free molecules of formamide, acetamide, nitro carbamide, magnesium nitrate and coordination compounds  $\text{Mg}(\text{NO}_3)_2 \cdot \text{HCONH}_2 \cdot \text{CH}_3\text{CONH}_2 \cdot 2\text{H}_2\text{O}$ ,  $\text{Mg}(\text{NO}_3)_2 \cdot \text{HCONH}_2 \cdot \text{H}_2\text{NCONHNO}_2 \cdot 1.5\text{H}_2\text{O}$  shown that novel coordination compounds were differenced each other and on homothetic them initial compounds.

Therefore, synthesized complexes of magnesium nitrate have individual crystalline lattice (table 1). Comparison interplanar space and relative intensity of magnesium nitrate, acetamide, formamide, nitro carbamide and coordination compounds  $\text{Mg}(\text{NO}_3)_2 \cdot \text{HCONH}_2 \cdot \text{CH}_3\text{CONH}_2 \cdot 2\text{H}_2\text{O}$ ,  $\text{Mg}(\text{NO}_3)_2 \cdot \text{HCONH}_2 \cdot \text{H}_2\text{NCONHNO}_2 \cdot 1.5\text{H}_2\text{O}$  presented that novel coordination compounds were differenced considerably each other and on homothetic them initial compounds. Therefore, synthesized complexes of magnesium nitrate have individual crystalline lattice IR-spectrum adsorption of free molecules of ligands and synthesized compounds has been studied. A basis of the comparison of IR-spectrum adsorption of free molecules of ligands and complex compounds  $\text{Mg}(\text{NO}_3)_2 \cdot \text{HCONH}_2 \cdot \text{CH}_3\text{CONH}_2 \cdot 2\text{H}_2\text{O}$ , frequencies were found at 3258, 2358, 1658, 1599, 1129, 1046, 827, 662, 603  $\text{cm}^{-1}$ . For compounds  $\text{Mg}(\text{NO}_3)_2 \cdot \text{HCONH}_2 \cdot \text{H}_2\text{NCONHNO}_2 \cdot 1.5\text{H}_2\text{O}$  frequencies were found at 440, 3351, 3223, 2361, 1626, 1597, 1151, 1047, 825, 667, 596, 468  $\text{cm}^{-1}$ .

The presented complex compounds shown that all causes molecules of formamide, acetamide, nitro carbamide are coordinated through oxygen atoms of carbonyl group. At the same time water molecules are held due to hydrogen bonds. Anion of nitric acid is coordinated by magnesium ions.

To sum up condition of synthesis was developed and complex compounds of magnesium nitrate with formamide, carbamide and thiocarbamide were recovered. Individuality, ways of formamide, carbamide, thiocarbamide, nitrate fragments molecules' coordination and thermic behaviour of synthesized compounds were proved by oscillation spectroscopy, derivative graph analysis. In addition, central ion was surrounded six atoms of oxygen and has geometric configuration of violent octahedron.

#### ***References / Список литературы***

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