

Urea Formaldehyde Aniline Based Polymer Ligand Synthesis And Research

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ABSTRACT

The work presents the results of the synthesis of polymer ligands based on urea, formaldehyde, and aniline via the condensation/polycondensation method, followed by modification with target functional groups. The obtained copolymers were characterized using FT-IR, $1\text{H}/13\text{C}$ NMR, thermogravimetry (TGA/DSC), scanning electron microscopy (SEM), and elemental analysis. The acid-base properties, density of donor centers, and complexation ability with model heavy metal ions in an aqueous medium were investigated. It was established that the synthesized materials possess high thermal stability, high functional group content, and efficient sorption/complexation performance, making them promising for applications in analytical chemistry, wastewater treatment, and as precursors for the fabrication of specific sorbents and ion exchangers. Where necessary, data on sorption kinetics and isotherms are provided.

Keywords:

Physic-Chemical, Complex, Urea, Aniline, Polymer, Oligomers.

Синтез И Исследование Полимерных Лигандов На Основе Мочевины, Формальдегида И Анилина.

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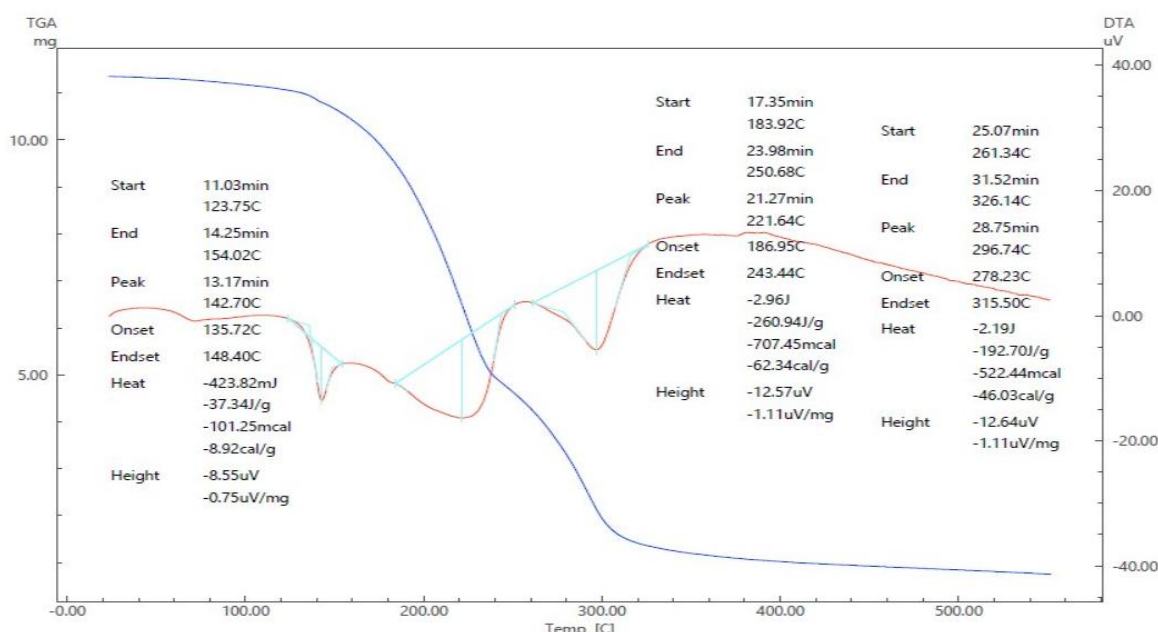
Аннотация: В работе приведены результаты синтеза полимерных лигандов на основе мочевины, формальдегида и анилина методом конденсации/поликонденсации с последующей модификацией целевыми функциональными группами. Полученные сополимеры охарактеризованы с помощью FT-IR, $1\text{H}/13\text{C}$ NMR, термогравиметрии (TGA/DSC), сканирующей электронной микроскопии (SEM) и элементного анализа. Исследованы кислотно-основные свойства, плотность донорных центров и способность к комплексообразованию с модельными ионами тяжелых металлов в водной среде. Установлено, что синтезированные материалы

обладают высокой термической стабильностью, значительной содер­жательностью функциональных групп и эффективностью сорбции комплексообразования, что делает их перспективными для применения в аналитической химии, очистке сточных вод и как прекурсоры для изготовления специфических сорбентов и ионитов. При необходимости представлены данные по кинетике и изотермам сорбции.

Ключевые слова: физико-химический, комплекс, моче­вина, анилин, полимер, олигомеры.

Introduction. Currently, the synthesis of new complex-forming polymer ligands, their separation from solutions of non-ferrous metals by complex sorption methods, and the study of the composition, structure, and physicochemical properties of coordination compounds formed during the sorption process are among the main tasks of the chemical industry. Thermo analytical studies were conducted on analyzers of the Tashkent Research Institute of Chemical Technology. According to the results of TGA, various exothermic and endothermic effects observed when the mass changes as a result of the decomposition of various functional groups of the chelating polymer ligand with increasing

temperature were analyzed. All samples of thermal analysis were carried out in a mortar made of aluminum oxide in a dynamic mode at a speed of 50 degrees/min. For the analysis of KFA (TGA) and (DTA), a maximum temperature of 600°C was selected, and the results of the analysis of this substance were studied in accordance with the results of the presented thermo gravimetric (TGA) and differential thermal (DTA) analysis. This substance was taken in an open-mouth crucible made of aluminum oxide, which is resistant to temperatures of 600°C, in an amount of 11.4 mg, and the temperature was gradually increased starting from 20°C (Figure 1).



- Mechanical properties: UFRs generally have high mechanical strength and toughness. They also have the ability to withstand high temperatures.

- General outlook: UFRs generally show good chemical stability and thermal stability.

- Epoxy resins: Urea-formaldehyde-based polymers are often used as epoxy resins.

3. Research methods:

- Chemical analysis: Analysis of urea-formaldehyde oligomers for defects and high efficiency by various chemical methods (e.g., gas chromatography, mass spectrometry).

- Mechanical tests: Various tests (e.g., artificial tensile, non-stick) are used to determine the mechanical properties of rubbers.

- Thermostability: Thermographic analysis and other methods are used to test the thermostability of polymers.

4. Importance and application:

- Standardization: The creation of urea-formaldehyde oligomers and their properties are of great importance in production and scientific research. Their many applications include relief materials, plates, varnishes and pastes, rubbers, etc.

Urea-formaldehyde aniline-based polymers are commonly referred to as "urea-formaldehyde aniline polymers". The synthesis and study of these polymers can be interesting and useful in many scientific and industrial fields. Below I will provide general information about the synthesis and research of these polymers:

I. Synthetics

Urea-formaldehyde aniline-based polymers are mainly produced by the reaction of urea and formaldehyde, with aniline being used as an additional component in this process. The synthetic process can be as follows:

1. Preparation for the reaction:

- A solution of urea and formaldehyde is prepared.

- Aniline is added, which changes the quality and properties of the polymer.

2. Polymerization process:

- Urea and formaldehyde are polymerized at high temperatures and/or with the help of catalysts.

- The addition of aniline is done to improve or change the chemical properties of the polymer.

3. Polymer purification and formulation:

- The polymer is obtained in a liquid or semi-solid state.

- In the next step, the polymer needs to be converted to a solid state, formulated, and purified.

II. Research

The study of polymers is carried out to study their physical, chemical, and mechanical properties. The research process may consist of the following stages:

1. Chemical analysis:

- Determination of the functional groups present in the polymer and their amount.

- Study of the reaction conditions and the effect of additives.

2. Evaluation of physical properties:

- Measurement of the strength, elasticity, and heat resistance of the polymer.

- Testing the resistance of the polymer to water, chemicals, and other external influences.

3. Study of mechanical properties:

- Analysis of the tensile, elongation, and other mechanical properties of the polymer.

- Study of how the polymer behaves under different conditions.

4. Research on application possibilities:

- Study the application possibilities of the polymer in various fields, for example, in construction, automotive industry, or electronics.

III. Application in practice

Polymers based on urea-formaldehyde aniline are often used in industry, because they have good mechanical properties, chemical stability, and long-term use. They are mainly used in:

- Construction materials: For good insulation and strength properties.

- Automotive industry: For control parts and interior materials.

- Electronics: As electrical insulators.

The synthesis and research of these polymers will give you interesting results and can be the basis for the creation of new technologies

Conclusion

The study of urea-formaldehyde oligomers helps to increase knowledge about their various properties, mechanisms, and applications. Their mechanical and chemical properties are of great

importance in their production and practical applications.

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