RESEARCH OF THE SYNTHESIS OF NITROGEN, PHOSPHORUS, AND SULFUR CONTAINING OLIGOMERS

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Abstract: Oligomer is a low molecular weight substance with the same chemical structure as polyester fiber, which is a by-product of the polyester spinning process. This article talks about oligomers, their composition of nitrogen, sulfur, phosphorus, synthesis process and their structure.

Key words: Oligomer, organic oligomers, chemical structure, nitrogen, sulfur, phosphorus, mass, molecule, substance.

An oligomer is a low molecular weight substance with the same chemical structure as polyester fiber, a by-product of the polyester spinning process. Polyester contains 1% to 3% oligomers. An oligomer is a polymer composed of fewer repeating units and its relative molecular weight is between small and high molecules. Most polyester oligomers are cyclic compounds formed from three ethyl terephthalates.

The effect of oligomers: colored spots and stains on the fabric surface; a white powder produced by dyeing yarn. When the temperature exceeds 120°C, the oligomer can dissolve in the dye bath and come out of solution and combine with the condensed dye. Defects such as spots and dots accumulated on the surface of machines or fabrics during cooling. Dispersion dyeing is usually held at 130°C for 30 minutes to ensure color depth and speed. Therefore, as a solution, the light color can be kept at 120°C for 30 minutes, and the dark color must be pre-cleaned before painting. In addition, dyeing under alkaline conditions is also an effective method for dissolving oligomers.

It is recommended to add nitrogen, sulfur and phosphorous substances during the synthesis of oligomers obtained from external symptoms. These substances make it possible to change the properties of oligomeric molecules, facilitate their reactions or introduce new properties. During the synthesis, these substances can also be used as catalysts for bulk reactions.

There are other details about the composition, structure and synthesis of nitrogen, sulfur and phosphorus stored in oligomers. These compounds are used in the synthesis of nitrogen, sulfur and phosphorous substances, to provide important properties such as polymer multiplication, cross-linking, sizing, etc. These oligomers allow variable reactions and facilitate cross-linking. Their structure and composition depends on the amount of these substances, their functional groups and main constituent elements. Such oligomers can be more complex, but their structure allows us to identify the chemical bonds in them and allow them to be modified to study and implement special properties.

The synthesis of oligomers containing nitrogen, sulfur, and phosphorus is a studied chemical process. In these processes, please use phosphorus ligands, metzones, which contain the structure of oligomers of nitrogen, sulfur and phosphorus elements. These phosphorligands retain the structure and properties of oligomers. In the synthesis process, a chemical reaction is created to create oligomers, and the structure and properties are studied using spectral analysis methods. The studied data is obtained using spectrometry, absorption spectroscopy, molecular measurement, infrared spectroscopy and other methods.

Spectral methods can be used to study the structure and properties of oligomers containing nitrogen, sulfur, and phosphorus. These methods make it possible to obtain information on changes in electromagnetic radiation.

Infrared methods (IR-spectroscopy): allow to determine the properties involved in the molecular structure of oligomers. Infrared methods are used to study functional groups, binaries and protein compounds created by substances containing nitrogen, sulfur, and phosphorus.

NMR-spectroscopy: In NMR methods, it is possible to determine protons, phosphorus, sulfur and nitrogen atoms associated with the oligomer molecule. In this method, information is obtained about the chemical environment of the oligomer molecule, the external compatibility of one or more components, and the properties used by the field.

UV-Vis spectrophotometry: Used to study the electronic energy level and electronic spectrum of the oligomer molecule. UV-Vis spectrometry is used to determine the unique optical properties of nitrogen, sulfur, and phosphorus reserves in oligomers.

These spectral methods have been used to determine the structure, properties, and chemical properties of oligomers. Their combination allows you to get a complete picture of the properties of the oligomer text.

Experiments are carried out with advanced laboratories in the field of chemistry, organic chemistry and polymer chemistry for the synthesis of oligomers containing nitrogen, sulfur and phosphorus and to study their structure and properties using spectral methods.

In these experiments, infrared (IR) and nuclear magnetic resonance (NMR) spectra are studied. Information about the molecular structure of oligomers and their functional group can be obtained through IR spectra. NMR spectra provide information about the structure and configuration of oligomer molecules and how they block phosphorus, sulfur, and nitrogen elements.

The information obtained using such methods helps to determine the properties of oligomers, their chemical and physical properties, for example, their properties in plastic bags, photosensitivity and other properties.

Analysis of obtained results: Physico-chemical properties were studied: density, melting point, solubility, IR spectroscopy and DSC in oligomers containing sulfur, nitrogen and phosphorus. Data on the physicochemical properties of the synthesized NMA-5 highly filling oligomer (with sodium tetrasulfide and ammonium polyphosphate organic halogen compounds) are presented in Table 1.

Physico-chemical parameters of thiokol oligomer

Indicators	thiokol oligomer
	NMA-5
Density , g/sm^3 ГОСТ 15139-69	1,28
Tpl ^{o}C	124
$\eta_{хв}$	0,065
Solubility	dimethylformamide
Appearance and color	brown viscous substance

In the IR spectrum of NMA-5, there are absorption bands confirming the presence of -CH_2- groups in the 2850-1470 cm^{-1} region and absorption bands confirming the

presence of - in the 1650 cm^{-1} region. $CONH_2$ groups are free. The IR spectrum includes absorption bands in the 3400 cm^{-1} region corresponding to primary - $CONH_2$ groups and absorption bands in the 3300-3440 cm^{-1} region corresponding to secondary -CONHR groups. Bending vibrations of all active groups appear in the form of strong narrow lines between the typical bands of $-CH_2-CO-$ bending vibrations in the region 1400 - 1465 cm^{-1}. Absorption bands in the regions of 800 and 1600 cm^{-1} confirm the presence of $-NH_2$ groups. The presence of groups with phosphorus R=O and R-O-C in the region 1000-1180 cm^{-1} is confirmed by a wide intense band and sulfur-containing compounds in the regions 400-900 cm^{-1}, 1040-1000-1000 cm. $^{-1}$060 cm^{-1} and 1100-900 cm^{-1}.

In addition, in the regions of 600-800 cm^{-1} and 1460 cm^{-1}, narrow lines of low intensity appear in IR spectroscopy, which contain bonds of the sulfur-containing compound. When looking at the IR spectra of NMA-5, a strongly intense $-CH_2-N-$ group is observed at 1400-1440 cm^{-1} and organic phosphates at 1180 cm^{-1} -1150 cm^{-1} (Fig. 1).

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