

SYNTHESIS AND PROPERTIES OF ORGANO-INORGANIC HYBRID POLYMER IONITES

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Abstract: In this article, polymer hybrid composites containing VM-AK-KK, VM-MMA-KK, Vpir-AK-KK were obtained. The thermal and mechanical strength of the obtained composite was studied and compared.

Keywords: dinitrile azbisiso maslyanoy acid, decomposition temperature, N-vinylmorpholine, methyl acrylate, vinyl pyridine, acrylic acid, mechanical strength, sopolimerizatsya. Copolymerization

In recent years, silicon-organic hybrid composites have increased interest in these materials due to their unique physical and chemical properties, such as thermal stability, mechanical strength, and stability in various aggressive environments.

Unlike most composites, this type of composite is not bonded through secondary effects, but through silicon and radical covalent bonding. Such bonds combine the organic and inorganic parts of the molecule to form composites with the above properties.

Substances such as 3-aminopropyltriethoxysilane, p-aminophenyltrimethoxysilane, 3-aminopropyltrimethoxysilane are often used to form a bond between organic polymers and silicon. Sol-gel, solution and solution mixing methods are mainly used to obtain organic-inorganic hybrid composites.

- a) When organic-inorganic hybrid composites are obtained by the sol-gel method, hybrid materials can be divided into cross-linked and chemically linked systems. In interconnected systems, there are no covalent chemical bonds between organic and inorganic substances. Here, these components are connected to each other through secondary interactions. There are particularly strong hydrogen bonds between organic and inorganic systems. In this case, polymers with functional groups such as hydroxyl, carbonyl and amide interact with the silanol group [1-3].
- b) b) When polymer-silicon composites are obtained in solution, the composites have better properties than conventional polymers. Such polymer-silicon composites are obtained by the addition of modified silicate during the polymerization of the polymer and the interaction of molecules. Polymer-clay composite is an example of such composites.
- c) c) Direct polymer solutions are also used to create organic-inorganic hybrid composites. In this case, layered silicates are mixed with a polymer solution and the system is heated and then cooled. The polymers that enter between the layers of silicon form a mesh in three-dimensional space. [3-4].

The fact that the molecules of the polymer substance with a hybrid structure form three-dimensional structures in space ensures their mechanical and thermal stability. In the conjugation of monomers, each monomer contains active groups or vinyl groups, and monomers conjugate to form macromolecules. Usually, the monomers that form macromolecules of this type contain polyfunctional, bi-functional or active vinyl groups according to the functional group they have [].

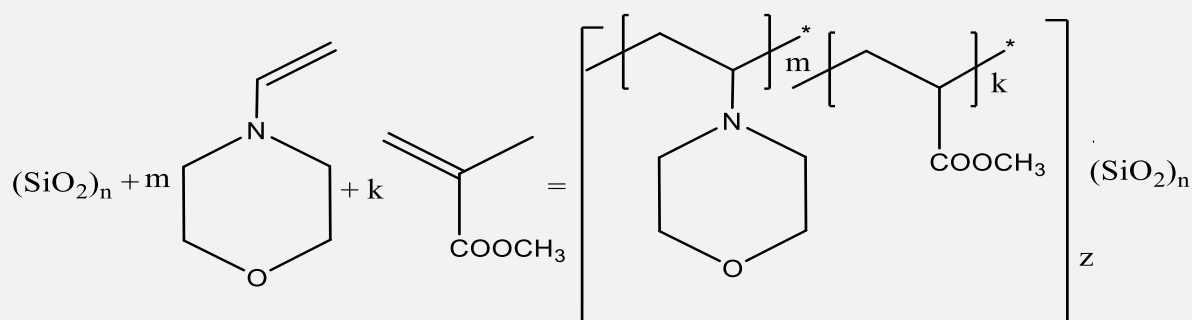
Synthesis of sorption composite materials with inorganic and organic matrix by sol-gel method allows easy influence on their composition, structure and properties.

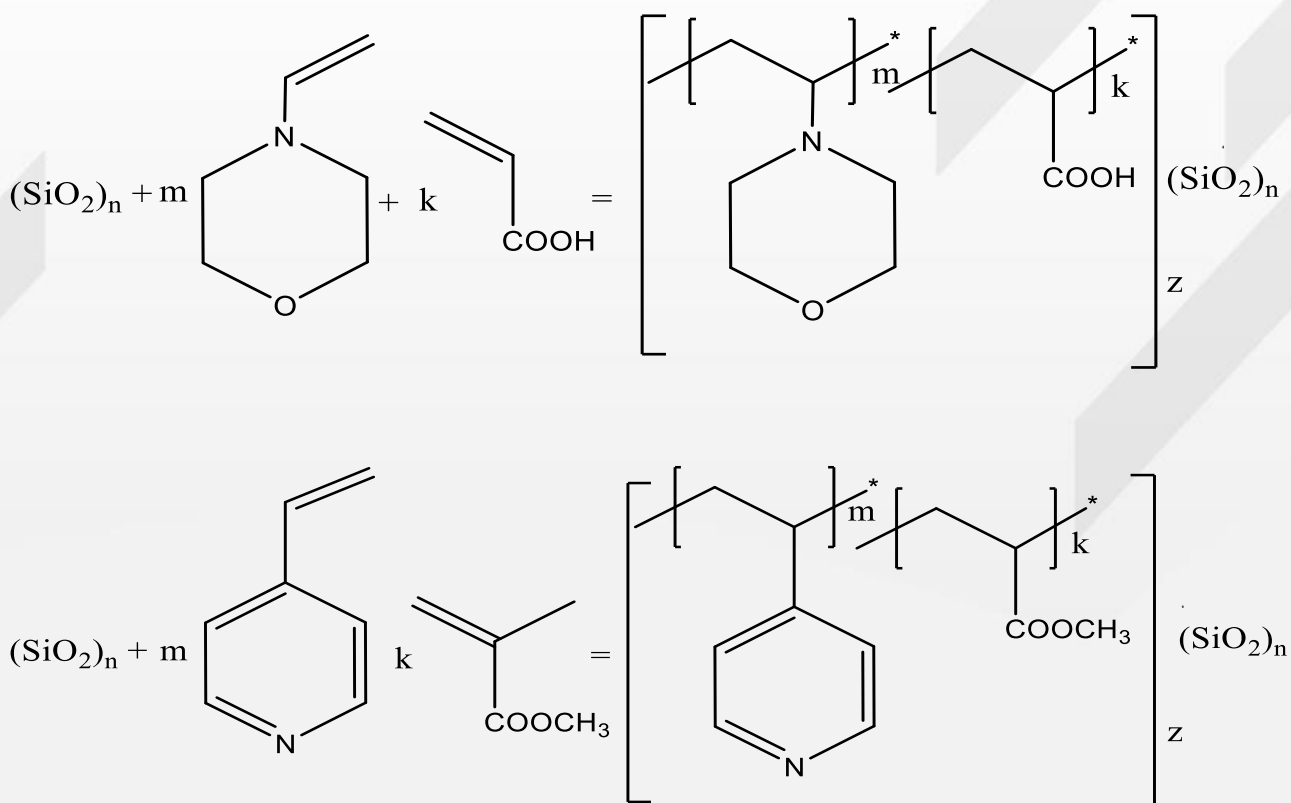
Hybrid composites containing an electron-donating group form a complex with d-metal ions in the solution and absorb sulfur. Ionites interact with molecules and ions holding empty orbitals to form complexes. The main indicators of such ionites are the sorption capacity, selective sorption of ions (selectivity), stability constants of the complex, and the structure of the ionite.

Selective sorption of metals, period of use, and sorption capacity of ionite depend on the structure of ionite and the active groups it contains.

Experimental part.

The process of copolymerization of monomers such as N-vinylmorpholine (N-VM) and acrylic acids (AK), N-VM methyl methacrylate (MMA), vinylpyridine (Vpir) AK was carried out in solution with the presence of DAK initiator. After the copolymerization process, the products were treated with colloidal silica (CC), precipitated twice, and then dried in a vacuum to a constant mass. The obtained solid white ionite was washed with distilled water and dried in a drying cabinet until it reached a constant mass [4].





The yield and decomposition temperatures of the hybrid composite were studied (Table 1).

Table 1

Properties of organo-inorganic hybrid polymer composites

Composite	amount, % wt.		SiO2 content, % wt.	Productivity, %	T _{steam} , °C
	N	Si			
VM-AK-KK	6,4	7	15	60	258
	5,9	9,8	21	56	276
	4,2	20,5	44	71	329
VM-MMA-KK	5,8	4,6	10	67	200
	5,2	9,3	20	66	254
	4,4	14,9	32	57	279

	7,0	5,1	11	70	214
Vpir-AK-KK	5,4	14,4	31	65	291
	4,2	21,4	46	76	359

Conclusions

Organo-inorganic hybrid polymer composites containing VM-AK-KK, VM-MMA-KK, Vpir-AK-KK were synthesized and their thermal stability was studied and compared. It was found that increasing the amount of colloidal silica in the composition of hydride composites increases its thermal and mechanical strength.

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