SYNTHESIS OF FURAN-CONTAINING OLIGOMERS AND INVESTIGATION OF THEIR PHYSICOCHEMICAL PROPERTIES

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Abstract. In recent years, furan derivatives have become increasingly important in the creation of materials and compositions with the desired properties. The traditional direction of furfural processing is the extraction of furfuryl alcohol obtained as a result of its condensation and resins with various specified properties. Taking into account the above, divinyl ether copolymers of furfuryl alcohol and vinylacetylene are synthesized in the article. Based on the method of furfuryl alcohol, divinyl ether was obtained with vinylacetylene in a highly basic system. The obtained oligomer molecular mass was determined cryoscopically and viscosimetrically.

Introduction. Currently, the scope of industrial organic synthesis is so large that the problem of limited natural resources of oil and gas necessary to meet its needs remains urgent. In this regard, the direction of obtaining basic compounds based on natural renewable raw materials is a prospect. The processing of plant carbohydrates, which make up 2/3 of the annual renewable biomass, opens a direct way to obtain furan compounds, which are genetically closely related to the simplest sugars. In recent years, furan derivatives have become increasingly important in the creation of materials and compositions with the desired properties. The traditional direction of furfural processing is the extraction of furfuryl alcohol obtained as a result of its condensation and resins with various specified properties. Tetrahydrofurfuryl alcohol is generally recognized as a "green" solvent for industrial use in the production of acrylates and epoxy resins, and is also included in environmentally friendly diesel fuel and technical cleaning compounds. Due to its low toxicity, the ability to destroy microorganisms, and its high solubility in organic and aqueous media, 2-hydroxymethyltetrahydrofuran

and its derivatives are successfully used in the pharmaceutical industry and cosmetology, in particular, as synthetic fragrances. Vinyl esters of furfuryl alcohol have high reactive activity. Taking into account the above, divinyl ether copolymers of furfuryl alcohol and vinylacetylene are synthesized in the article. Based on the method of furfuryl alcohol, divinyl ether was obtained with vinylacetylene in a highly basic system.

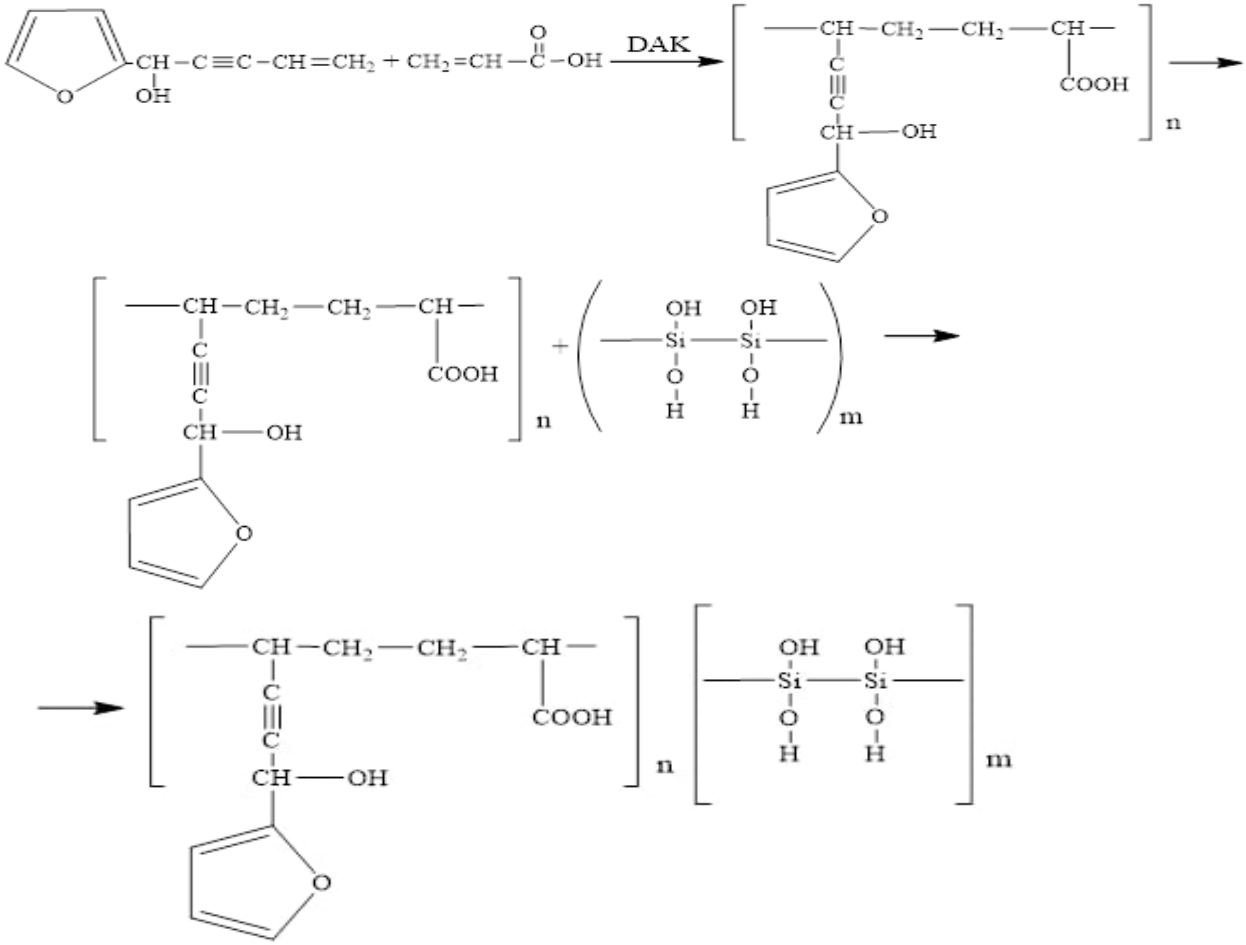
50 mg of vinyl furfuryl ether, 50 mg of acrylic acid, 50 mg of colloidal creminisol and dinitrile azobisimoic acid (DAK) were used as an initiator (1% by mass of monomers) in a reaction flask. The flask was equipped with a thermometer, placed on a magnetic stirrer and heated at 85-120 ^{0}C for 2 hours. At the end of the reaction, the viscous, black and hardenable polymer - divinylfurfuryl acrylate formed in the flask was purified by precipitation three times and dried until it reached a constant mass. The molecular mass of the obtained polymer was determined by cryoscopic and viscometric methods and was around 2700-4200 depending on the synthesis method and the influencing factors. The highest molecular mass was formed in the presence of an initiator at 120^{0}C and 2 hours. As the temperature decreases and mixing in the reaction mixture decreases, the formation of oligomers occurs due to clarification. To purify the obtained oligomer, it was carried out by the extraction method in the presence of various solvents. The extraction results are tabulated below. (Table 1).

Table 1.Solubility of reactants and products in solvents

№	Solvents	Initial substances			Product
		Furfuryl alcohol	Vinylacetylene	Acrylic acid	Divinyl furfuryl acrylate
1	Isopropyl	dissolves	does not dissolve	does not dissolve	does not dissolve
2	Octane	does not dissolve	does not dissolve	does not dissolve	does not dissolve
3	Isobutyl	dissolves	dissolves	dissolves	dissolves
4	Heptane	dissolves	does not dissolve	dissolves	does not dissolve
5	Toluene	does not dissolve	dissolves	dissolves	dissolves
6	Hexane	does not dissolve	does not dissolve	dissolves	does not dissolve
7	Amyl alcohol	does not dissolve	does not dissolve	dissolves	dissolves
8	Dean	does not dissolve	does not dissolve	dissolves	does not dissolve
9	Ethyl alcohol	does not dissolve	dissolves	dissolves	dissolves
10	Dimethylformamide	dissolves	dissolves	dissolves	dissolves

As can be seen in table 1, the initial reagents were dissolved in ethyl, amyl alcohol, dimethylformamide, toluene, isobutyl, using the fact that the product is insoluble in decane, octane, hexane, the oligomer was separated cleanly in the presence of heptane and its physical properties were studied, the refractive index of divinylfurfuryl acrylate measured in a refractometer is shown in the following table.

The granules of the synthesized copolymer obtained in the colloidal silica matrix are distinguished by their high ion exchange capacity. The overall process can be represented by the following reaction scheme.



Identification of the synthesized oligomer was carried out by a modern inspection method. The obtained substance was examined in the IR spectrum and found to be consistent with the composition of the obtained substance.

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