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Oil and Fat Production Waste and Its Use in Various Fields

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Abstract:
The results of a study of the structures, compositions and physicochemical properties of gossypol resin and other ingredients are presented. The possibility of using them in the development of composite chemical preparations for treating cotton seeds has been shown.

Keywords: Chemical reagent, chemical technology, gossypol resin, caustic soda, sodium salts, carboxylic acids, carbolic acids, seed protectant.

Introduction

The leading agricultural crop of Uzbekistan, cotton, is affected by many diseases. Obtaining high and stable yields of high quality is impossible without implementing a set of measures to protect yields from such dangerous diseases as gommosis and root rot. Cotton root rot is a very common disease. It is found everywhere and causes great harm to the cotton growing industry of the Republic. Every year, an area of 200-300 thousand hectares is reseeded or reseeded.

Pre-sowing disinfection of seeds in order to protect them from diseases and pests is one of the most necessary plant protection measures. Already in ancient times, people tried to protect seed material from harmful organisms using various substances - ash, olive pomace, crushed cypress leaves, salt water, Glauber's salt, copper and arsenic compounds, etc.

Purification of wastewater and food products, concentration of metal ions in hydrometallurgy, catalysis of many organic reactions, decontamination of water from nuclear reactors, deoxygenation of water from thermal power plants are impossible without the use of ion-exchange materials. In this regard, increased demands are placed on ion exchangers, primarily on their thermal stability and radiation resistance. A search is underway for available and cheap monomers and other raw materials for the synthesis of ion-exchange materials.

Ion exchange materials based on gossypol and gossypol resin are of significant interest. The gossypol molecule contains a naphthalene core, which gives it high thermal, chemical and radiation resistance. Phenolic hydroxyl and aldehyde groups in the structure of gossypol and gossypol resin determine their greater reactivity and complexing properties.

Based on gossypol and gossypol resin, sulfo- and phosphoric acid ion exchangers were synthesized by precondensation of gossypol and gossypol resin with aldehydes in an acidic medium.

The condensation of gossypol with aldehydes occurs simultaneously through several functional groups. When gossypol interacts with furfural in an acidic medium, the intensity of the absorption bands of the OH group in the region of 1250-1400 cm-1 decreases, the absorption band in the region of 1630 cm-1 (aldehyde group) disappears, and the region of

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700-900 cm-1 (aromatic nuclei) changes. . In the UV spectra of the gossypol-furfural polymer under the same conditions, a decrease in the absorption band of aldehyde groups in the region of 370 nm and changes in the region of 290 nm associated with the substitution of gossypol in the aromatic nuclei are clearly observed. The disappearance of aldehyde groups in the precondensate during the interaction of gossypol and furfural in the NMR spectrum is evidenced by the absence of single-proton signals at 11.34 ppm; in addition, the intensity of the signal at 5.8 ppm decreases, which is due to the presence of a hydroxyl group .

The data obtained indicate that the condensation reaction of gossypol with furfural occurs at the hydroxyl groups of gossypol and the aldehyde groups of furfural. It should be borne in mind that gossypol in an acidic environment is capable of entering into a self-condensation reaction due to the interaction of its own hydroxyl and aldehyde groups, as well as due to active hydrogen in position 4.

The change in aromatic protons at 7.7 ppm (NMR spectrum), the change in the IR spectra at 700-900 cm-1 (aromatic nucleus), in the UV spectrum in the absorption region of 290 nm give reason to believe that The condensation of gossypol with furfural can occur with the participation of 2 hydrogen atoms in position 4,4' and the aldehyde group of the furan reagent, similar to the condensation of phenols with aldehydes.

Optimal conditions for the polycondensation of gossypol and gossypol resin: condensation temperature 70-80°C, synthesis duration - 6 hours, gossypol: aldehyde ratio 1:0.5 (wt, parts), gossypol resin: aldehyde from 1:0.1 up to 1:0.5 (mass, parts), catalyst - concentrated sulfuric acid (10% of the mass of the initial components), heat treatment time for polycondensation products - 6 hours at 120°C.

Resins based on gossypol and gos-sypol resin and α-furylacrolein or crotonaldehyde, acrolein, isovaleric aldehyde and acetaldehyde have been synthesized similarly. Resin static exchange capacity (SEC) 0.1 N each. NaOH solution 1.5-2 mEq/g due to ionogenic groups (OH-, OH-phenolic) in the structure of the starting materials substances and COOH groups that are formed as a result of partial oxidation of the polymer with sulfuric acid (catalyst). Potentiometric titration of cation exchangers based on gossypol resin or gossypol with aromatic aldehydes made it possible to establish that it has a form characteristic of polyfunctional ion exchangers. The inflections of the titration curve of sulfonic cation exchangers should be attributed at pH 3.2 (pK 2.3) to the SO3H group, pH 9.2 (pK 8.8) to the COOH group, pH 10.3 (pK 10.69) to the OH-phenol group , pH 12.3 (pK 13.05), apparently to the OH group. For phosphoric acid cationites, the inflection of the curve at pH 8.9 (pK 8.9) is characteristic of phosphonic acid groups.

In the spectra of cation exchangers obtained on the basis of gossypol resin, absorption bands are observed in the region of 3000-3500 cm-1, which relate to vibrations of OH-phenolic groups. After treating the polymer with concentrated sulfuric acid or phosphorus trichloride, changes are observed in the spectra of the cation exchangers. In the absorption region of 1050-1210 and 950-1200 cm-1, new bands appear related to vibrations of the –SO3H and –P-PO3 groups. The oxidized cation exchanger also contains an absorption band at 1710 cm-1. This band refers to vibrations of -C=O-groups in -COOH-groups.

The polycondensation products of gossypol and gossypol resin with aldehydes, obtained

under optimal conditions, were used for the synthesis of sulfonic and phosphoric acid cation exchangers. Dried and crushed resin particles to a size of 1-1.2 mm were sulfonated with concentrated sulfuric acid at 120-140°C for 5 hours, phosphorylated with phosphorus trichloride in the presence of anhydrous AlCl3 at 60-70°C for 6 hours, followed by hydrolysis water at 0°C.

The resulting cation exchangers were converted to the H+ form by treatment with a 5% alkali solution and then acid.

The resulting cations have an SOE of up to 7.5 mg • eq/g based on gossypol resin and up to 6.0 mg • eq/g based on gossypol resin.

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