

Study of Aspen Wood Carboxymethylation by the Method of Complete Factor Experiment

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Optimization of conditions of carboxymethylation of aspen wood in isopropyl alcohol was carried out by the method of complete factor experiment. The influence of liquid module, quantity of sodium monochloroacetate (Na-MCA), duration and temperature of preliminary treatment of wood with sodium hydroxide (NaOH) on the properties of carboxymethylated products was investigated. The regression equations describe the influence of reaction conditions on the yield and the properties of the products (solubility in water, percent content of carboxymethyl groups, relative viscosity). Three parallel syntheses were carried out to check the conformity of the equations obtained during our calculations. The adequacy of the equations was estimated according to Fisher criterion. It was established that all obtained dependencies adequately describe the process. The temperature and duration of preliminary treatment of aspen wood with NaOH have the dominant influence on properties of the products. This follows from the analysis of sizes and marks of factors in these equations.

The structure of products was identified by IR-spectrometry. The reaction products keep morphology of wood fibers and have brown coloring. The IR-spectra of carboxymethylated aspen wood have intensive characteristic bound (1600 cm^{-1} and 1380 cm^{-1}) responsible for valence oscillation of carboxonium group COO^+ . The percent content of carboxymethyl groups changes from 6.9% to 26.2%, solubility in water changes from 63 to 90% and relative viscosity changes from 1.04 to 1.13. The obtained products can be used as chemical reagents for preparation of flush liquids for drilling oil and gas wells.