Hydrophilic-hydrophobic Interactions, Polychronous Kinetics and Molecular Mechanisms in the Processes of Production and Modification of Fiber Materials from Wood and Plants

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The kinetic inhomogeneity of pulping and bleaching processes in pulps from wood and plants due to chemical and structure inhomogeneity of lignocellulose polymer matrixes was studied with employing a polychronous computer-kinetic model. An adequate description of kinetics of delignification is presented, involving a rate constant homogeneous spectrum for wood and rate constant discrete spectrum for annual plants with a lower heterogeneity matrixes. At processing such plants as hemp, kenaf and cane the high quality fibrous pulps were obtained, which were equal to or exceeded in its physico-mechanical characteristics the CTMP from soft- and hardwoods. The standard - vinegar acid delignification has been considered as one of the perspective and more environmentally-friendly organosolvent pulping in generally used solvents without any mineral agents of high toxicity. The mechanisms of transport of electrons from donor hydrophilic media into the reaction centers of hydrophobic globules of lignin were examined.

The ways of hydrophilic-hydrophobic combinations have been studied to produce the composite materials based on cellulose and polymers (such as polyethylene, polypropylene, etc.). The methods of hydrophobing the cellulose fibers by creation of connecting links between polyolefins and polyacrylates under irradiative-chemical and chemical (by catalysts of Ziegler-Natta type) initiation effects and by condensation immobilization of surface-active substance (SAS) molecules are demonstrated. It is shown also a possibility to create a joint dispersion of cellulose and polyolefin fibers in a water medium by the physical adsorption of SAS on the surface of polyolefin fibers for wet production of cellulose- polyolefin paper composites.

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