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DELIGNIFICATION OF SOFTWOOD BY OZONATION

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The development of an effective and environment friendly delignification process for wood is the urgent task of modern science and technology. Ozonation of wood is one of the possible ways of delignification as ozone is briefly used for bleaching the residual lignin of lignocellulose by-product in the process of pulp manufacturing. In addition, lignin is known as a natural source of a lot of chemical products. So, lignin transformations by ozonation are also of particular interest.

Ozonation of aspen sawdust containing different amounts of water was investigated. The kinetic curves of ozone absorbtion in the cause of wood ozonation were obtained. Ozone consumption values corresponding to the completion of ozonation process were determined. These values of ozone consumption were shown to be governed by the sawdust sample water content. A cellulose containing material with a low (1-3%) residual lignin content was found to produce under ozonation. Ozone solved in water was proposed to be responsible for wood delignification.

Lignin and carbohydrate components conversions under wood ozonation were investigated by UV- and IR- spectroscopy. The character of lignin transformations depended on the value of water content in the sample. When water content was below the value of fiber saturation point (FSP) of the wood sample lignin condensation processes occurred. At the values of water content higher the FSP value lignin conversion by means of ozone was unlike those above. At low values of ozone consumption the dominant products of lignin conversion were aromatic ketones, acids as well as unsaturated acids. A number of acids (formic, oxalic, acetic acid) as the final products of aromatic lignin structures oxidation were formed.

A role of water content in the softwood delignification was comprehended. Water presence was found to be a prerequisite to the delignification of wood because of the swelling of wood in water vapors. Besides, water dissolved ozonation products with low molecular weight and consequently, water presence served to deep oxidation of lignin in a vegetable cell.

Carbohydrate components of wood were probably partly destructed by ozone, but this process could be minimized by optimization of the ozonation regime. Some ways of wood delignification with relation to decrease the ozone consumption were considered.