OBTAINING OF 1,6-ANHYDROSACCHARIDES UPON FAST PYROLYSIS OF WOOD

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Renewable plant biomass may be regarded as the potential resource for the development of technologies for obtaining fuel, which is an alternative for petroleum products. Technologies of fast pyrolysis of biomass are the most promising methods for thermochemical conversion. In Latvia, there are considerable forest resources: forest cover about 40% of the territory. The development of technologies for fast pyrolysis of wood in Latvia is determined by the necessity for obtaining new energy production sources, as well as unused resources of deciduous waste wood.

The fast pyrolysis process can be organised as energetically self-sufficient, as there is a possibility to obtain biooil using gaseous and solid pyrolysis products in energy cycle. The existing fast pyrolysis technologies are divided depending on the configuration principles of the main bioreactor, and ablation type reactors are currently characterised as promising.

Pyrolytic biooil has a complex composition of hydrocarbon compounds and phenols, owing to which searches for the most economically attractive avenues of their use are under way. The following ones can be energetic and chemical usage, namely, isolation of individual monomers or groups of chemical compounds. The most valuable of them are anhydrosaccharides, levulinic acid and different polyphenolics. The high value of those chemical products in comparison with fuel could make profitable isolation of them even in small quantities.

The aim of the present work is to investigate the possibility to obtain 1,6-anhydrosaccharides – levoglucosenone and levoglucosan upon catalytic fast pyrolysis of deciduous wood in an ablation type reactor.

The study was carried out in a laboratory vertical reactor with two successively connected chambers with autonomous heating, respectively, for decreasing the material's moisture and subsequent pyrolysis. The yield of pyrolytic oil upon pyrolysis of untreated deciduous wood at 500^{o}C in this reactor was equal to 60-65%. Ortho-phosphoric and sulphuric acids were used as catalysts.

It was found that, upon pyrolysis of the wood treated with ortho-phosphoric acid (2.5-4% from the oven-dry material) the yield of pyrolytic oil was equal to 50- 45% at the pyrolysis temperature 375^{o}C. The levoglucosenone content in the oil varied within 10-25%, the amount of levoglucosan being insignificant, namely less than 1%. The highest yield of levoglucosenone was obtained upon introducing in wood 3% ortho-phosphoric acid and drying at 150 ^{o}C within 50 min.

We have shown earlier that, upon pyrolysis, sulphuric acid has a catalytic action mainly on the formation of levoglucosan. Our experiments using the ablation type reactor have shown that, upon pre-treatment of wood with sulphuric acid (0.05 and 0.1% from the oven-dry material) and the pyrolysis temperature 475^{o}C, both levoglucosan (9-12%) and levoglucosenone (7-10%) are formed.

The properties of the obtained pyrolytic oils are investigated.