POTENTIAL OF PYROLYSIS FOR VALUABLE PRODUCTS OBTAINING FROM WHEAT STRAW LIGNIN PRODUCED BY CIMV TECHNOLOGY

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Thermo-gravimetrical analysis oflignin extracted from wheat straw in organic acids media have shown that its degradation in the inert atmosphere takes place mainly in the temperature range of 200-500^{o}C. Half of lignin is degraded when temperature reaches 450^{o}C. Therefore study of lignin thermal conversion aimed at phenolic products obtaining was performed at 400, 450 and 500^{o}C. Potential component composition of volatiles formed in the process of lignin thermal treatment was evaluated using analytical pyrolysis (Py-GC/MS) data. Excluding considerable amount of water, CO_2 and acetic acid used in the technological process, volatiles consist of phenolic lignin-derived compounds (by 40%) and carbohydrate-derived products (by 20%). More than 60% of phenolic compounds found in volatiles are guajacyl derivatives. The major product of carbohydrates degradation is acetic acid. Washing of CIMV lignin with 1M NaOH allows decreasing acetic acid content in volatiles by tenfold.

Two configurations of fast pyrolysis realized in flowing (inert gas flow) and ablative-type reactors were used for phenolic fraction obtaining. The maximum yield of phenolic compounds was achieved at 450^{o} C in the case of ablative reactor usage (7,6%).

Application of catalysts (Na+ and K+) allowed to increase the yield of phenolic compounds up to 8,5%. Significant increase in content of phenols without aliphatic side chains in volatiles showed that in the case of catalytic pyrolysis the disruption of Caryl-α-Calkyl bonds occurred. Approximately half (48%) of phenolic fraction consists of guajacyl derivatives (GC/MS/FID data).

Taking into account comparatively low yield of phenolics the possibility of pyrolytic treatment usage for another valuable products obtaining from CIMV was considered. With this purpose the slow pyrolysis (450^{o}C) in screw-type reactor was performed. The high yield (44% in terms of CIMV lignin) of carbonized product – biochar and detection of water as a major component of volatiles (total yield 16%) indicated intensive development of condensation reactions in conditions of slow pyrolysis. Biochar obtained was characterized by low specific surface area (230 m^2/g), however its biological activity revealed in influence on cornplants development was rather high. Addition of biochar to sand substrate (1g/kg, climatic chamber) promoted increasing (on the sixth day of experiment) of dry mass of plant over ground part and roots, 15% and 20%, correspondingly.

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