

Thermodynamic Properties of Crop Macrocomponents

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Thermodynamic properties for various samples of cellulose, starch and lignin were determined based on their heat capacities in the temperature range of (5 to 370) K measured by adiabatic calorimetry, and the enthalpies of formation obtained from combustion calorimetry. It was demonstrated that the specific heat capacities, entropies and enthalpies of formation of cellulose and starch have a weak dependence on the sample origin and structure. All the compounds were found to be thermodynamically unstable towards their transformation into CO₂, liquid H₂O, and graphite even at $T = 298.15$ K. The equilibrium compositions for the mixtures obtained during gasification of the considered materials were calculated for the temperature range of (298 to 1700) K. The adiabatic temperatures of thermolysis and combustion in oxygen for the studied compounds were determined. The energy required for conversion of the initial materials into the fuel gas was estimated. Addition of water to the studied biopolymers during gasification allows one to increase the yield of fuel gas. The optimal amounts of water allowing one to get the highest yield of fuel gas in the thermodynamically controlled process were determined.