

# THERMOPHYSICAL PROPERTIES OF VOLATILE PRODUCTS OF BIOMASS LOW TEMPERATURE PYROLYSIS

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In the low-temperature pyrolysis (torrefaction) of biomass as a result of thermal decomposition of the organic component there are formed volatile products consisting of non-condensable gases and vapors of high-molecular organic compounds. When developing torrefaction technologies and methods for utilization of volatile products, that are hazardous for the environment, data on thermophysical properties of pyrolysis gases and vapors are needed.

The aim of the paper was to calculate the heat capacity and the heating value of volatile products that are released during the biomass heating up to a temperature of 600 K. Data on the composition of volatile products formed at different temperatures and residence times were taken from [1]. As a parameter, determining the composition and thermophysical properties of volatile products, the weight losses in torrefaction process on dry ash free basis of the starting biomass was adopted. In calculations the values of heat capacity and enthalpy of formation of the organic compounds constituting the volatile products of torrefaction were taken from the NIST database [2]. In the absence of appropriate data, there was applied the method of group contributions [3], the essence of which is that the sought thermophysical quantity is calculated by summing the contributions of the individual structural and atomic groups forming the compound under consideration.

As a result the heating value and the temperature dependences of the heat capacity for volatile products formed during the torrefaction process at weight losses up to 17% were determined. The maximum difference in the values of heat capacity of volatile products corresponding to various weight losses does not exceed 6%.

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1. Prins M.J., Ptasiński K.J., Janssen F.J.J.G. // *J. Anal. Appl. Pyrolysis*. 2006. V. 77. P. 35.
  2. NIST Chemistry WebBook, <http://webbook.nist.gov/chemistry/form-ser/>
  3. Joback K.G., Reid R.C. // *Chem. Eng. Commun.* 1987. V. 57. P. 233.