Chemical Exergy of Canola Biomass Components

Z.A. Antonava[C, S], Yu.V. Maksimuk and A.A. Simirskii
Research Institute for Physical and Chemical Problems, Minsk, Belarus
antonava@bsu.by

G.J. Kabo, A.V. Blokhin and L.S. Karpushenkova
Chemical Faculty, Belarusian State University, Minsk, Belarus

Thermodynamic properties of canola biomass components: seeds, straw, oil, and also diesel fuel produced from oil have been studied in order to determine their energetic efficiency. Heat capacities of the components have been measured with an adiabatic calorimeter in the range 80-350 K and entropies have been obtained. Enthalpies of combustion have been measured with a bomb calorimeter and standard chemical energies have been calculated.
Thermodynamic properties (uncertainty): enthalpy of combustion, kJ/kg; heat capacity, J/K/kg; entropy, J/K/kg; standard chemical energy, kJ/kg; at T=298.15 K and P=101.325 kPa per kilogram of dry substance for canola components: seeds – 29360(76), 1858(7), 1721(14), 29313(78); straw – 20160(73), 1120(4), 1149(12), 20435(74); oil -39620(33), 1965(8), 2183(16), 39521(39); fuel – 39810(33), 1984(8), 2563(17), 39573(39), respectively.

Based on those results, we have evaluated the energy balance of canola biomass per 1 hectare per year at a yield of 3000 kg of seed (14 mass % humidity) and 6800 kg of straw (20 mass % humidity). Natural increase of energy is 170,900 MJ per hectare per year that exceeds the similar value for the forest wood in Belarus in 8 times.