

537f Investigations of the Calorific Value of Volatiles and Pyrolysis Residuum of Solid Fuels as a Function of Time

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A significant share of the energy demand is provided by the thermal utilization of solid fuels, whereby biomass plays an important role since it is CO₂-neutral and renewable. Biomass consists of up to 85 wt.% volatiles (e.g. spruce) which are released from the fuel particle during pyrolysis. Therefore the step of pyrolysis influences the quality of the thermal conversion of the solid fuel significantly. To determine the calorific value of pyrolysis gases two principal methods are available: 1. Measurement and analysis of the composition of the volatiles during pyrolysis of the solid fuel and calculation of the calorific value afterwards. 2. Determination of the calorific value by a 'Differential Scanning Calorimeter' (DSC). With this method it is not necessary to detect all components of the pyrolysis gases. A DSC was developed at our department which enables a direct detection of the calorific value of solid fuels without detecting the gas components in detail and was presented at the AIChE Annual Meeting 2004. The content of this contribution is the presentation of experimental results. Considering for example experiments with beech wood particles of different geometries it can be observed that the bigger the particles are the more significant the maximum of the calorific value at the end of the experiment time is. The explanation for this phenomenon are the secondary crack reactions: Secondary tar cracking occurs when the pyrolysis gases flow from the inner particle regions towards the particle surface passing the hot carbon structure. Furthermore the heating values of the solid residues and of the tars as a function of fuel conversion will be presented as well as the results of stopover experiments. These results are the basis for the design and/or optimisation of combustion / gasification units (e.g. geometry of the furnace, primary/secondary air distribution, etc.).