Abstract

***Anal. Chim. Acta.*, 544**, 191-198 (2005)

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Prediction of heating values of biomass fuel from elemental composition.

The heating value of biomass is an important parameter for the design and the control of power plants using this type of fuel. The so-called higher heating value, HHV, is the enthalpy of complete combustion of a fuel including the condensation enthalpy of formed water. Numerous empirical equations have been published to relate the heating value to the elemental composition of fuels other than biomass.

Data of 154 biomass samples of very different origin (for instance wood, grass, rye, rape, reed, brewery waste, and poultry litter) have been selected from the database BIOBIB. Each sample has been characterized by the contents (in mass% of dry material) of carbon, hydrogen, nitrogen, oxygen, sulfur, chlorine and ash. PCA of these data shows a clustering according to the origin of the samples.

A subset of 122 samples, all consisting of plant materials, has been used to develop regression models for a prediction of HHV from the elemental composition. Models with best predictive ability have been obtained using the contents of carbon, C; hydrogen, H; and nitrogen, N, and applying the methods OLS and PLS with the variables C, C^2, H, C.H and N. The standard errors of prediction of the best new models are considerably smaller than those obtained with models found in literature.