

## **Multi-recovery of specific waste biomass for production environmentally materials. Part 2. Evaluation selected characteristics of sulphate waste liquor for their energy utilization**

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**Abstract:** *Multi-recovery of specific waste biomass for production environmentally materials. Part 2. Evaluation selected characteristics of sulphate waste liquor for their energy utilization.* The article deals with effective utilization of biomass waste (from cellulose pulp and paper industry) for environmentally accepted materials. The second part of the paper is devoted to another utilization of kraft waste effluents from the aspect of their thermal characteristics to assess their suitability as energy use. Attention is given to the evaluation of selected thermal characteristics of kraft effluents calorimetric methods.

*Key words:* biomass, waste, recovery, thermal characteristics

### INTRODUCTION

The issue dealt with in the second part of the paper builds on the multifunctional recovery of specific waste biomass. The focus in the second part of the paper is devoted to another way utilization of kraft waste effluents from the aspect of their thermal properties to assess their suitability as energy use or for specific purpose of ecological fire protection substances (Marková, 2010; Ružinská and Jabłoński, 2008; Kubo et al. 1996).

The method of preparation of sulphate pulp (the pulp and paper industry) is due to the ongoing delignification processes to create large quantities of waste products, e. g. black kraft liquors. At present, the organic components are burned kraft effluents – liquors, which uses in the recovery process and provide the thermal energy and carbon needed to reduce sodium sulfate to sulfide, as one of the components boiling solution required to regenerate each cycle in the production of kraft pulp (MAŠURA, 1998).

Such use of the waste - black kraft effluents is not the optimal way to recovery their effective use in terms of technology, since it is prepared products with higher added value, f. e. wood composite materials containing treated waste kraft black liquor in combination with polycondensation adhesives. Such an experiment designed and prepared wood composites (plywood and particle board) showed similar characteristics were compared with a standard generated wood materials, but with significant economic savings and significant environmental aspects - the reduction of emissions of gaseous pollutants (reduction of the formaldehyde releasing of prepared glue mixtures in reciprocal compensation PF adhesives modified sulphate liquors) (RUŽINSKÁ ET AL. 2010).

Currently looking for ways to make efficient use of waste products - kraft liquor, f. e. well as energy recovery. To assess the suitability of the proposed application, it is necessary to know the thermal properties of these waste products in the original and in modified form (CHRISTIANSEN, 1985).

The second part of paper deals with the efficient use of waste products prepared from biomass processing (production of chemical pulp – sulphate black liquors) for the for recovery in the energy field, using thermal characteristics these specific waste.

## MATERIALS AND METHODS

In the experimental part of the attention unmodified, origin kraft black liquor from production of chemical pulp – sulphate black liquor (4 samples). The moisture content of kraft black liquor - 50.49 %.

### Calorimetric method

For purposes of the experiment to monitor the behavior of matter at the complete combustion of the defined terms used in the IKA device calorimeter C 5000 control, designed to measure and determine the calorimetric heat and calorificity of solid and liquid substances.



Fig. 1 Equipment IKA CALORIMETER C 5000 control

Based on experiments carried out under ISO 1928 values were calculated heat of combustion (calorimetric heat), calorificity and the residual ash after the experiment. The obtained results are showed in Tab. 1.

Tab. 1 Experimental results obtained from calorimetric methods evaluation of calorimetric heat, calorificity and content of ash samples (moisture content 50,49 %)

Measurements	Calorimetric heat (J.g <sup>-1</sup> )	Calorificity (J.g <sup>-1</sup> )	Content of ash (%)
1	3 679,32	1 885,71	23,20
2	3 854,69	2 061,08	24,51
3	3 811,25	2 093,51	25,17
4	3 736,33	1 942,72	24,20
<b>Average</b>	<b>3 770,40</b>	<b>1 995,75</b>	<b>24,27</b>

## RESULTS

Based on the results it can be concluded that prepared mixtures (with unmodified - origin kraft black liquors as waste product) is not suitable for combustion purposes, compared with the calorimetric heat down other organic fuels (MARKOVÁ ET AL. 2010).

Inappropriateness of applying the test material for the purpose of combustion also results in a graphic depending on temperature rise depending on the time course of the experiment (Fig. 2).

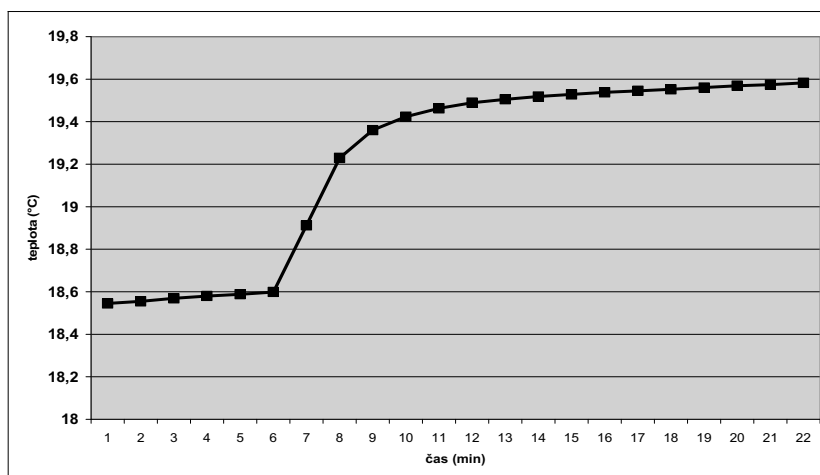


Fig. 2 The graphic dependence of temperature rise during the calorimetric test sample compostable mixture depending on the time

Seeks materials for the purpose of firing is the perfect combustion of fuel the whole stake in the shortest time, which means a sharp temperature rise in a relatively short time. The condition does not meet the test material. Also, for the combustion process is the total volume of fuel burned evenly. In the case of fuel monitor residual shares in the form of ash. For the sample was too much ash content as incrusting substances (MARKOVÁ ET. AL, 2010).

#### CONCLUSION

Results of calorimetric methods were compared with the conclusions of thermal analysis (TG, DTG, DSC – Ružinská et. al., 2008; MARKOVÁ ET. AL, 2010), which shows that the kraft black liquor showed low thermal stability, but low calorific value.

It is clear that the effective recovery of waste effluents sulphate for the preparation of products with higher added value should be primarily directed towards their use for the preparation of new composite wood materials and energy recovery for commercial purposes is not appropriate, especially for low calorific value and high incrusting substances.

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**Streszczenie:** *Wielokierunkowe wykorzystanie biomasy odpadowej do produkcji produktów ekologicznych. Część 2. Ocena wybranych cech ługów siarczanowych w aspekcie ich wykorzystania energetycznego.* W artykule omówiono efektywne wykorzystanie biomasy odpadowej (powstającej w przemyśle celulozowo-papierniczym) do wytwarzania nowych rodzajów wyrobów drzewnych. Część druga poświęcona jest dalszemu wykorzystaniu odpadowych ługów siarczanowych z punktu widzenia ich właściwości termicznych w celu oceny ich przydatności do wykorzystania energetycznego. Termiczne właściwości ługów siarczanowych zostały oznaczone metodą kalorymetryczną.

**Work is published with support of Grant Agency of Slovak Republic Ministry of Education VEGA nr. 1/0841/08 „Wood characteristics its quality with application to production of special products”.**

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