NEW WAYS OF RECYCLING OF A WOOD SAWDUST

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INTRODUCTION

Recycling of wood sawdust is the important technical problem. Recycling is possible to perform in a direction of obtaining of fuel which is convenient for use by traditional methods or in a direction of obtaining of other useful products – saccharides. turpentine ets. One of perspective directions of sawdust transfer into standard fuel is the obtaining of fragile product with high content of carbon. Such product may be crushed with the subsequent forming of steady water-carbon suspensions [1,2] or its briquetting on the standard equipment. Process can be carried out by autoclave treatment in water. water vapour . water solutions and supercritical water fluid.

A perspective direction can also be via adsorption of a hydroxides on a fibrous structure of wood and subsequent formation of oxides at the thermal treatment of the formed composite. The material obtained thus can find wide application as filler for plastic and in ceramics manufacture.

MATERIALS AND METHDS

Processes of autoclave treatment of sawdust in water. water vapour. water solutions of HC1 and NaOH or in a supercritical water fluid were investigated. Autoclaves with volumes of 15. 250 and 1000 cm^3 were used. In Tables 1 and 2 weight loss observed at the treatment of coniferous sawdust. conditions of treatment and the chemical composition of obtained product are presented.

Table 1. Weight loss observed at the treatment of coniferous sawdust.

Reaction medium	Temperature (^oC)	Time (hours)	Weight loss (%)
Treatment in air	200	48	41
In autoclave. liquid H_2O	220	48	48
Treatment in air	200 then 300	1.5 then 1	58 (total)
In autoclave. vapour of H_2O	300	48	56
In autoclave. 5% solution of NaOH	200	24	50

Table 2. Chemical composition of obtained products (weight %) and conditions of treatment of coniferous sawdust.

N	Treatment conditions	N	C	H	O
1	In autoclave. T = 200°C. t = 36 hours. reaction medium liquid H_2O	0.64	66.00	6.01	27.35
2	The sample № 1. air-dried at 200°C during 5 hour	0.48	63.60	1.80	34.12
3	In autoclave. T = 220°C. T = 36 hours. reaction medium liquid H_2O	0.20	68.40	4.20	27.17
4	The sample № 3. air-dried at 200°C during 5 hour	0.28	58.50	2.27	38.95
5	In autoclave. T = 300°C. t = 48 hours. reaction medium liquid H_2O	0.51	81.40	4.40	13.69
6	In autoclave. T = 300°C. t = 48 hours. reaction medium vapour of H_2O	0.35	82.6	4.20	12.85
7	In autoclave. T = 400°C. t = 48 hours. reaction medium fluid H_2O.	0.52	87.8	3.36	8.32
8	In autoclave. T = 200°C. t = 36 hours. reaction medium 3% solution of HCl	0.39	67.30	3.41	28.90
9	In autoclave. T = 200°C. t = 48 hours. reaction medium vapour of H_2O	0.36	67.90	4.30	27.44
10	In autoclave. T = 200°C. t = 36 hours,.without water addition	0.27	71.20	5.20	23.33

As seen from the presented Tables, the autoclave treatment leads to carbonization of sawdust with formation of a fragile product with the content of carbon 60 – 88 % by weight depending on the process parametres. The yield of material was about 50 % of sawdust weight. This material can be easily crushed in usual mills till the size of particles 5 – 15 micron. Such material allows to obtain the steady water-carbon suspension which can be widely used for industrial boiler-houses.

The method will allow to replace with sawdust some kinds of fuel widely applied now including natural gas or coal. The cost of production of this material is lower than it is for the kinds of fuel applied now.

Sawdust can be used as active agents in processes of obtaining of new materials
Processes of formation of fibrous structures of aluminium oxides at thermal treatment of coniferous sawdust preliminary treated by a solution of aluminium oxychloride were investigated. In Figures 1-4 are presented the electronic microphotos of coniferous sawdust treated by a solution of AlOCl and then heated-up at various temperatures.

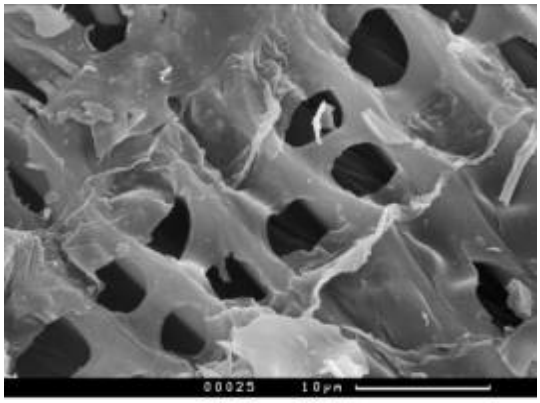

Figure1

Sawdust coniferous was boiled in 2 % solution of AlOCl. The deposit is dried up at 100^{o}C and heated at 600^{o}C for 0.5 hour.

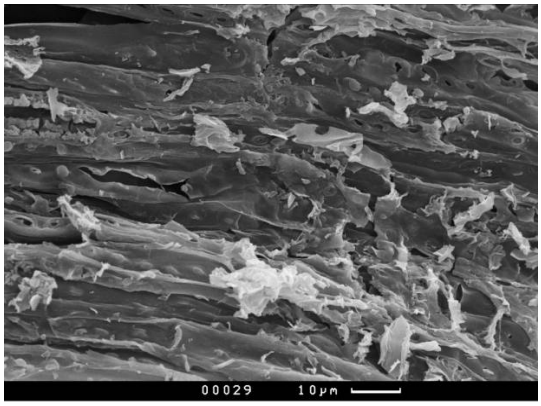

Figure 2

Sawdust coniferous was boiled in 0.5 % solution of AlOCl. The deposit is dried up at 100^{o}C and heated at 600^{o}C for 0.5 hour.

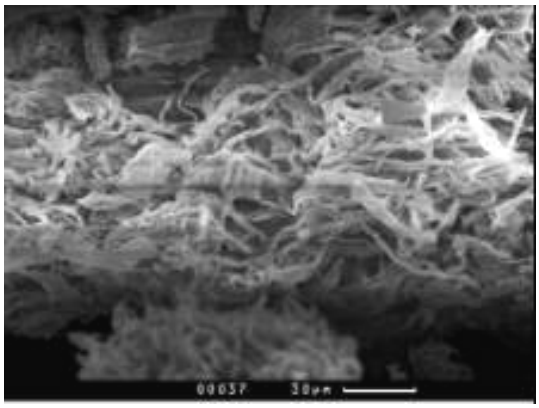

Figure 3

Sawdust coniferous was boiled in 0.5 % solution of AlOCl for 0.5 hour The deposit is dried up at 100^{o}C and heated at 800^{o}C for 0.5 hour.

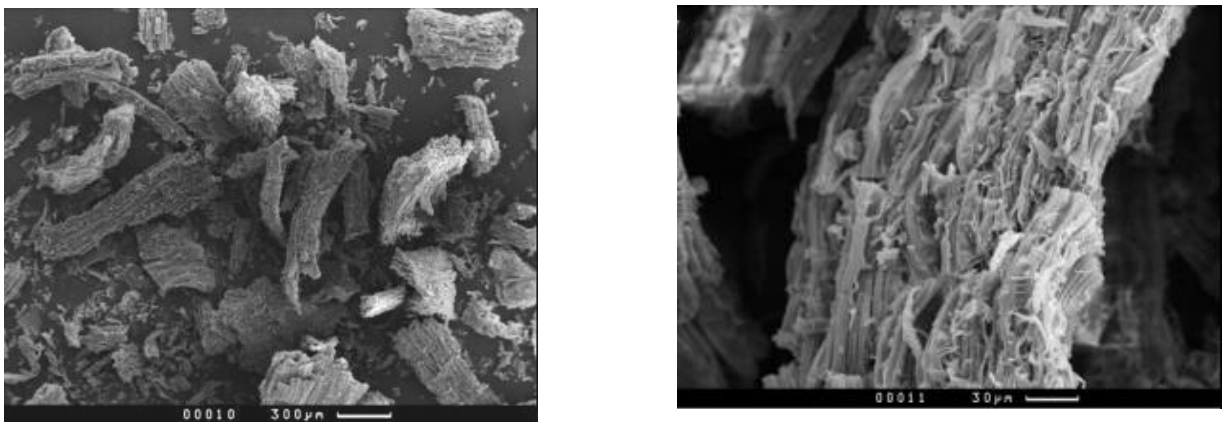

Figure 4.

Sawdust coniferous was boiled in 2 % solution of AlOCl for 0.5 hour. The deposit is dried up at 100°C and heated at 800°C for 0.5 hour.

At the Figures 1-4 are shown the electronic microphotos of samples of gamma-aluminium oxide obtained on treatment of coniferous sawdust with solution of aluminium oxychloride and on subsequent heating at temperatures of 600 – 800°C . The obtained material may find application as multipurpose filler.

Use of sawdust as activators in processes of hydrothermal treatment of inorganic hydroxides has allowed to obtain interesting results. In particular, at autoclave treatment of hydrargillite in a solution of NaOH at 200°C were obtained crystals of boehmite of plate habitus (Figure 5) which can be used for superfinishing treatment of various materials.

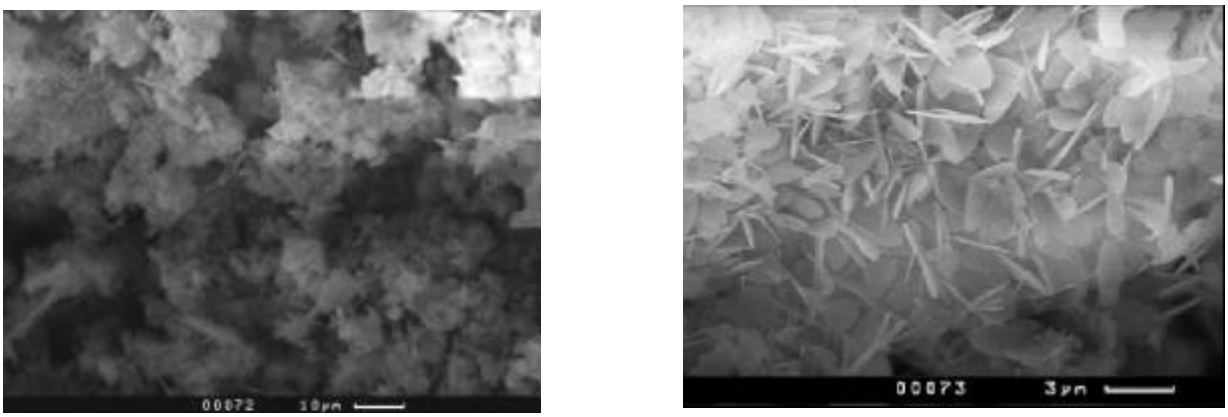

Figure 5

Boehmite obtained at autoclave treatment of mix of hydrargillite and coniferous sawdust in 2 % a solution of NaOH at 200°C within 24 hours.

CONCLUSION

The basic result is the opportunity to obtain from wood sawdust or lignin the powder with high content of carbon and with the particles size of the order of several micron.
It will allow to recycle the industrial wastes, which contaminate environment – sawdust, non-standard wood, lignin, in a new kind of fuel

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The theory and applied aspects of hydrotransportation of firm materials,(Russ),M,1981.