Table 1. The chemical composition of the investigation kaolin

The content of oxides, wt.%									
SiO_2	Al_2O_3	TiO_2	Fe_2O_3	MnO	CaO	MgO	K_2O	Na_2O	Δm
42.61	38.80	2.26	0.75	–	0.17	0.70	0.22	0.13	14.36

The main reason of low strength of kaolin after burning up to full sintering is the formation of cristobalite in large amounts. It is negative for using kaolin as the main raw material in the technology of high-strength aluminosilicate proppants. One of ways to improve the strength characteristics of the product (including granular material) is the addition of alumina. It neutralize process of cristobalite formation by binding silica, released from kaolinite structure, in the secondary mullite.

Another reason of low strength of proppants based Borovichy kaolin should be associated with their natural rusks. Appropriate to consider changes in the tecnological production of proppant. Kaolin fed to wet grinding with next drying in a tower. This provide the powder of raw materials with a stable composition, structure and properties for using in a aluminosilicate proppants technology.

OPTIMIZATION OF SULPHATE LIGNIN RECYCLING IN AIR PLASMA

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Lignin is a wood component which is hard to utilize. It produces during wood chemical conversion at paper and paperboard plants [1].

On the other hand it is a potential raw material resource for many countries. According to the International Lignin Institute annually in the world 70 million tons of technical lignin are produced, but only 2% are used for industrial, agricultural and other purposes. The rest is burned in power plants or disposed as sludge lignin (SL) [2]. Nowadays there are not effective technologies to utilize SL, although literature review last time shows increasing interest of scientist to this problem.

Sulpate lignin (SL) produces at paper and paperboard plants during chemical digestion of wood. SL equals to 30–35% of the feedstock and has permanent formulation [3]: ash 1.0–2.5%; acids (most sulphuric) 0.1–0.3%; water-dilutable compounds 9–11%; resiny compounds 0.3–0.4%; Klason's lignin 85% (sulfur content 2.0–2.5% including unconsolidated 0.4– 0.9%).

Often SL is used as boiler fuel. Caloric value of dry lignin is 5500– 6500 kcal/kg, 18–25% humidity – 4400–4800 kcal/kg, 65% humidity – 1500–1650 kcal/kg [3].

Effective and environment-friendly utilization of waste based on lignin could be reached in plasma. SL is induced by utilization in form of water-organic composition (WOC) having optimal formulation and adiabatic combustion temperature of 1200 °C.

Figure 1 shows influence of SL content on adiabatic combustion temperature of optimal WOC.

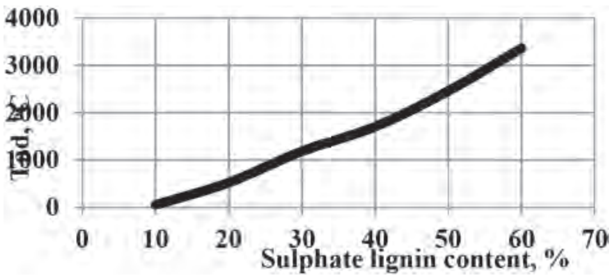

Fig. 1. *Influence of SL content on adiabatic combustion temperature of optimal WOC*

Based on the calculation findings optimal WOC was determined with maximus SL content (70% water: 30% SL). It has $T_{ad} \approx 1200$ °C net calorific value 6.34 MJ/kg. Plasma recycling of 1 ton/h of such WOC lets to get 1.76 MW-h additional heat energy.

To determine optimal modes of research process equilibrium formulations of gaseous and condensed products were calculated for case SL plasma utilization. Program «TERRA» was used for this purposes. Initial parameters of calculations were pressure (0.1 MPa), temperature range (300–4000 K) and heat transfer agent (air) mass fraction (0.1–0.95).

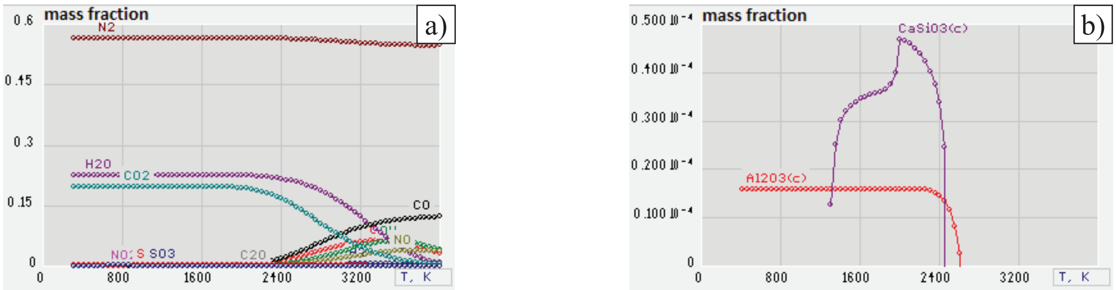

Fig. 2. *Equilibrium formulation of gaseous (a) and condensed (b) products of SL plasma utilization in form of WOC (74% air : 26% WOC)*

Figure 2 shows characteristic equilibrium formulation of gaseous (a) and condensed (b) products of SL plasma utilization in form of WOC where air mass fraction is 74%. To disappearance of soot C(c) (Figure 2b).

This fact suggests that SL utilization process in air plasma in this case (74% of air) occurs normally.

Taking into account this temperature data and temperature of plasma torch, it should be that plasma torch is able to provide an inflammation and an ignition of WOC in rector.

All the obtained results could be used in creating commercial plants based on HFT plasmatrom for effective plasma recycling and utilization of different industrial wastes.

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THE OPTIMIZATION OF SURFACTANTS` TECHNOLOGY ON THE BASIS OF ALKYL BENZENE SULPHONIC ACID

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Today in the world the consumption of synthetic detergents (SD) on the basis of the surfactant is growing annually. So the market volume of the surfactant amounted about 26.8 billion dollars in 2012, it is expected to grow to 31 billion in 2016 and to 36 billion in 2020 [1]. LLC "KINEF" is the biggest manufacturer of linear alkylbenzenesulfonates in Russia. In this regard, it is necessary to pay close attention to the optimization of linear alkylbenzenesulfonates technology and it will allow to achieve a higher economic impact on companies.

Linear alkylbenzenesulfonates (LABS) is the main used component for the production of SD. These chemical substances are aromatic compounds with hydrocarbon chain of 10–13 carbon atoms and one or more sulfonate groups. The feedstock for the production of LABS is alkyl benzene sulphonic acid (ABSA). The technology of producing ABSA comprises the following steps: 1) extracting of n-paraffin fractions C_{10-20} (Parex process); 2) separation of n-paraffins C_{10-13} during the prefractionation; 3) production of olefins on Pt-catalyst after the dehydrogenation of paraffins (Pakol process); 4) hydrogenation of diolefins to mono-olefins (Difayn process); 5) alkylation of benzene with olefins to form linear alkylbenzenes (LAB); 6) sulfonation of LAB [2].

The aim of this work was to develop recommendations for optimizing the technology of high-quality alkyl benzene sulphonic acid (content of alkyl benzene sulphonic acid is not less than 96 wt.%, content of compounds are not more than 2 wt.%) on the basis of an application using of the developed mathematical model` sulfonation of LAB.