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Research Article

EFFECT OF RETARDANTS ON OGNEGASITELEM COMPOSITES ON THE BASIS OF VEGETATIVE RAW MATERIALS

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ABSTRACT

Was developed insulation Board materials of pulverized waste unrecoverable spinning flax and cotton on the basis of urea-formaldehyde and phenol-formaldehyde binder. For material normalized indicators of ognegasitelem. In the work of the received results determine the extent of damage by weight when burning in "ceramic box" samples of composite material with a filler of waste spinning cotton and linen fibers. To reduce the Flammability of the material used, the ammonium fluoride and aluminum trihydrate. The ammonium fluoride as effectively as the trihydrate of aluminium reduces the flammability of the composite material. Composite plate material on the basis of irrevocable pulverized waste spinning cotton and flax fibers with addition of ammonium fluoride trihydrate and aluminum in terms of damage, by mass while burning and time self-combustion meets the Flammability group G1 according to the standard of the Russian Federation 30244-94.

INTRODUCTION

One of the main tasks of the development of building materials is to ensure the safety requirements regulated by the Federal law 123 "Technical regulations about requirements of fire safety" [5] and the Regulation 305/2011/EU (89/106/EEC) [20]. One of the main properties characterizing the fire hazard of building materials, including insulation based on vegetable raw materials, is combustible. According to GOST 30244-94 [6], ASTM E-84 [1] and EN 13501-1 [4] materials must meet the requirements of fire resistance. This figure is characterized by the parameters of the mass loss during combustion and the duration of sustained flaming combustion.

Development of composite thermal insulation materials based on wood waste materials and agricultural crops known since the early twentieth century [11]. The use of waste recycling of industrial fibers (cotton, flax, hemp, kenaf, etc.), is less common [23]. Flammability and thermal degradation of the materials from vegetable raw materials is one of the most important aspects that must be well studied for their use in construction.

F. Yao and colleagues [23] investigated the thermal decomposition processes of these types of natural fibers like wood, bamboo, agricultural waste and bastfibre used in the manufacture of composite materials.

To methods of improving thermal stability of plant fibers is their chemical modification. So A. K. Rana and colleagues [19] with acetylation of jute fibers have received a significant increase in their thermal stability. Widespread studies on the use of flame retardants to reduce the flammability of lignocellulosic materials [14, 21, 22]. There are many fire retardant compounds to reduce the flammability of lignocellulosic materials, inorganic-aluminum trihydroxide, sulfates, and borates of ammonium [2], phosphorus-containing flame retardants [18], the halogenated additives. Improving the effectiveness of fire protection is provided by use of nanoparticles of inorganic retardants [8, 9, 10, 15, 17]. Reduces the flammability and synthesis of the combined polymers. Clara J. Jeyageetha colleagues found that the presence of polyaniline in the composites improves the thermal stability of the material [3]. The decline of combustibility of materials with the addition of the alumina trihydrate is due to the endothermic dehydration of supplements, which reduces the temperature of the flame burning.

Halogenated flame retardants are the same structures have different efficiency. There is evidence that the efficiency of inhibitors increases in the order F<Cl<Br<I [16]. The hydrogen halides interact with the active centers of the flame, however, a significant chichemical inhibition of flames confirmed mainly for bromine compounds [12, 13]. Rarely to improve

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ognegasitelem use fluoride, although the PTFE-polytetrafluoroethylene has an oxygen index of 95 %, and the polyvinyl chloride-49 %. This allows to hypothesize that fluoride can be effective retardants.

MATERIALS AND METHODS

This study was made of the composite plate is heat insulatingtion based on a core of non-refundable pulverized waste spinning cotton and linen fibers. As binder was used phenol-formaldehyde resin SPI-3014 and urea formaldehyde resin KFS. The binder consumption was 30% by weight of vegetable filler. As an additive flame retardant used NH_4F and $Al_2O_3 \cdot 3H_2O$ in the amount of 20 % by weight of the filler. Plates were made according to the technology of fiberboard wet method of production by drying at 80°C. Tests were carried out in the installation "ceramic box" according to GOST R 53292-2009 [7].

RESULTS AND DISCUSSION

The results of determining the measure of mass loss of samples during combustion given in the table.

Table Results of determination of combustibility of specimens

Partyofcomposites	Degree of damage of samples* mass during combustion, %
SPI-3014 (control without retarding combustion)	63.34/65.52
KFS (control)	68.53/71.25
SPI-3014 + NH_4F	14.7/17.32
KFS+ NH_4F	18.27/23.54
SPI-3014 +$Al_2O_3 \cdot 3H_2O$	15.41/17.61
KFS+$Al_2O_3 \cdot 3H_2O$	19.79/24.43

*Above the line for cotton/ flax

The decline of combustibility of plate composite materials with addition of alumina trihydrate is due to the endothermic dehydration of supplements. The specific heat of dehydration of alumina trihydrate is 1170 J/g. Given the fact that the aluminum trihydrate contains the water of 34.6 % by weight, the result of the endothermic dehydration reduces the temperature of the flame burning. The gaseous products of thermal degradation of vegetable filler and the binder is diluted by water vapor, while significantly reduces the formation of smoke.

The test showed that the composite plate material of the pulverized waste cotton and flax and binder SFG-3014 and KFS in terms of "the degree of damage by weight when burning" refers to the flammability group G4.

Use as a flame retardant NH_4F helps to reduce the loss of mass during combustion of the composite up to 15...18 %, with the addition of when you remove the flame the specimens do not support combustion. When adding the ammonium fluoride is a high ognegasitelem than the use of trihydrate of aluminum. These indicators correspond to the group of combustibility G1[1].

Thus, for the manufacture of composite thermal insulation materials of non-returnable production wastes cotton and linen fibers make rational use of the ammonium fluoride, which allows to obtain a material with a duration of self-burning 0 h, with the degree of damage by weight not more than 20 %; values of the indicators meet the group of combustibility of materials G1.

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