AMERICAN JOURNAL OF SOCIAL AND HUMANITARIAN RESEARCH

ISSN: 2690-9626
Vol. 3, No. 8, 2022

Improving Methods of Obtaining Fireproof Wood Tiles Building Materials Based on Local Waste

S. M. Djuraev, PhD
Ministry of Emergency Situations of the Republic of Uzbekistan

B. P. Makhmatkulov
Academy independent researcher, Ministry of Emergency Situations of the Republic of Uzbekistan

ABSTRACT: In an experiment with the purpose of studying the physicochemical properties of a Maple Leaf, the heat and flammability characteristic of a sample made from a crushed fraction of a Maple Leaf was determined.

KEYWORD: formaldehyde, wood sawdust plates, consistency, fireproof, urea-formaldehyde binder.

Today, all economies in the world are acknowledged to need to make the shift to energy-saving and fire-safe materials in order to be contemporary. The building materials industry provides the opportunity to broaden the manufacturing range of a variety of heat- and fire-resistant, difficult-to-burn materials. The majority of today's construction materials have high thermal conductivities that typically surpass 0.1 coefficient and don't meet current international norms. Single-layer concrete buildings, which were often utilized to construct buildings in the past, do not satisfy current energy standards. The most dangerous material in terms of fire is now thought to be facing plates, which are frequently used to finish the surfaces of walls and suspended ceilings in civil buildings. The most pressing issue is likewise seen to be how to stop a fire from spreading to a building's aluminum composite panel (ACP) exterior.

Utilizing materials with the following thermal technical and fire safety properties can help buildings achieve the requisite degree of energy conservation and fire safety: Very low heat conductivity, water and moisture absorption, low fire risk values, good durability, and generally speaking should have significant qualities like low cost. Currently, contemporary urban planning involves the following: Modern materials of a constructional and non-constructional nature started to appear in the building materials market as a result of modern design and other requirements, improving the energy efficiency and fire safety of various types of buildings and structures; reducing the overall weight of structures.

These materials include sandwich panels, highly effective thermal insulation, and others that are replacing heavy, cumbersome structures in contemporary building. A considerably better energy efficiency decreases the quantity of emissions released into the atmosphere by 25 to 30 percent, and as a result, lessens the impact of energy consumption on climate change. This is another environmental advantage of creating samples of construction materials from local garbage. Additionally, the improvement in energy efficiency in the residential sector involves steps to adapt to climate change by strengthening the defenses of homes against bad weather.

The properties of the maple tree and its leaves were studied throughout the study process. We are aware that everything in nature is proportionately formed. The soil is covered in dried, yellowed maple leaves throughout the autumn. The leaves fall to the ground as a result of natural shedding and are safe for both people and the environment. But we gather dry leaves and begin burning them to obtain purity. Toxic gases that have collected in the leaves are then discharged back into the environment. By breathing the smoke created when dry leaves are burnt, thousands of individuals put their health at risk. The human respiratory system is impacted first. Through the blood, toxic compounds circulate throughout the body can seriously harm the kidneys, liver, brain, and nervous system.

Experts estimate that up to 9 kg of smoke particles are discharged into the atmosphere for every ton of dry leaves burnt. Dust, nitrogen oxides, carbon dioxide, heavy metals, and the most hazardous compounds for people—dioxin and dioxane—are among these microparticles. These harmful compounds harm the immune system and inhibit the function of hormones and vitamins when they enter the human body. How to get rid of maple leaves is one of the issues facing the world today. The harm produced by burning maple leaves is the cause. Another method is to bury the fallen leaves in the ground and use them as fertilizer the next spring to create halo effects in the leaves. However, it has been experimentally demonstrated that after being buried for one or more years, the maple leaves nearly did not decay when they were uncovered. Another significant issue is that maple leaf piles are very large and heavy, making it difficult for beautification systems to remove them from metropolitan areas. This issue hasn't been resolved yet. The 15x6x3 mm sample made from the crushed fraction of the maple leaf was tested in a series of three-stage experiments to find out how well it resisted heat and fire in the experiment to explore the physico-chemical characteristics of the maple leaf.

Figure 1

The appearance of a maple leaf in a crushed form.

Figure 2

Wollastonite powder

The capacity of a material to preserve its physical characteristics (structure, strength, density, and form) under the effects of temperature is known as temperature resistance (limiting temperature). With the aid of instruments, material physical parameters such as temperature linear contraction or expansion (temperature coefficient of linear contraction), changes in mechanical strength, and density are determined for establishing temperature tolerance.

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
under Volume: 3 Issue: 8 in Aug-2022 https://grnjournals.us/index.php/AJSHR

We determine the highest permissible temperature for the use of heat-resistant material. The thermal resistance of the materials selected for the experiments is as follows. ^{0}C

Wollastonite mineral powder ………….……. 1600-1800 ^{0}C ;

Vermiculite powder …………………..............1100-1300 ^{0}C ;

Binders (Sodium Liquid Bottle)…………...700-900 ^{0}C .

In the first experiment, 15x6x3 mm samples were placed in a specific mold for 1, 3, and 5 days with 400 grams of sodium liquid glass as a binder and 2-3 mg fractions of 70 percent maple leaf shavings, 20 percent wood shavings, 2 percent vermiculite and vermiculite mineral. samples were examined in a muffle furnace in compliance with **GOST 10633-78 specifications (Plity drevesnostrujechnye. Obshchie privala podgotovki I provenetiya fiziko-mekhanicheskikh ispytaniy).** At a temperature of 500 0C, the initial composition was exposed to thermal and dynamic influences in order to establish its strength, homogeneity, and thermal tolerance. The experiment to ascertain the sample's heat tolerance produced a favorable outcome. The sample's beginning mass was 168 gr., and the experiment's weight from the muffle furnace was 104 gr. Its strength did not decline, its form did not alter, and it practically demonstrated that it does not burn. Its color changed from light brown to dark brown, but it did not lose its thermal resistance, and the experimental muffle furnace it was taken from lost 38 percent of its weight.

Figure 3. Vermiculite powder

Figure 4. Wood shavings

Figure 5. Liquid bottle

Figure 6

Molding process

Figure 7

Examples of experiment 1

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
under Volume: 3 Issue: 8 in Aug-2022 https://grnjournals.us/index.php/AJSHR

In the second compositional sample experiment, samples of sodium liquid glass as a binder (13 percent added volume), vermiculite and vermiculite mineral (7%), and maple leaf sawdust (2-4 mg fraction) were placed in a special mold for periods of 1, 3, and 5 days. The samples for these periods were GOST 10180. A test process was conducted using a high level thermal resistance in a muffle furnace in accordance with the standards of -90.

The homogeneity and thermal tolerance of the second composition were assessed after it was thermally subjected to a temperature of 600 0C. The experiment to ascertain the sample's heat tolerance produced a favorable outcome. The sample had a starting mass of 130 gr, and the muffle furnace weight was 66 gr. Its strength did not diminish, its form did not alter, its color moved from white brown to gray, it did not lose its heat resistance, the weight loss from the muffle furnace trial was 49.3 percent, and it practically showed that it does not burn.

Figure 8 *Figure 9*

Samples of experiment 2 in the mold Samples of experiment 2

In the experiment on the third composition sample, 15x6x3 mm samples were burnt in a Mufel furnace at a temperature of 7000 for 30 minutes with a binder of 10% sodium liquid glass and a proportion of 2-3 mg of vermiculite and vermiculite mineral.

The sample's starting mass was 143 gr. and the weight gained from the experiment in the muffle furnace was 82 gr. as a result of the experiment to ascertain the sample's thermal tolerance. When it was taken out of the oven, it had turned from light brown to light gray and was now reddish in hue. The weight loss acquired from the muffle furnace experiment was 42.7 percent less than the beginning mass, and the form did not change. Its heat resistance was also quite low.

Figure 10

Samples of experiment 3 in the mold

Figure 11

Samples of experiment 3

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
under Volume: 3 Issue: 8 in Aug-2022 https://grnjournals.us/index.php/AJSHR

In the FVV Academy's lab, three 15x6x3 mm samples were chosen and subjected to thermal exposure at 500, 600, and 700^{0}C in a muffle furnace.

Figure 12. 30 min to sample 1. during exposure to a thermal temperature of 5000C

Figure 13 30 min to sample 2. during exposure to a thermal temperature of 600^{0}C

Fig. 14 30 min to sample 3. during exposure to a thermal temperature of 700^{0}C

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
under Volume: 3 Issue: 8 in Aug-2022 https://grnjournals.us/index.php/AJSHR

Table 1. Tested flame and heat retardant coating compositions

No	Thermo-vermiculite powder ,%	Wollastonite mineral powder , %	Wood shavings %	Crushed fraction of maple leaf, %	Sodium liquid bottle, gr	The given thermal effect	Conclusion on the degree of flammability
1		2	20	70	400	500	Non-flammable
2	5	2	-	80	400	600	Highly flammable
3	5	10	25	50	400	700	Flammable

Indicators before and after thermal exposure to the prepared samples

Sample No	Weight before the test, gr	Weight after the test, gr	Difference gr.	Difference %
1	**168**	**104**	**64**	**39,1**
2	**130**	**65,8**	**64,2**	**49,3**
3	**143**	**82**	**61**	**42,7**

The test results of the compositions presented in Table 1 showed that they have high efficiency. The result of the fourth content experiment is shown in the graph below. (Figure 1).

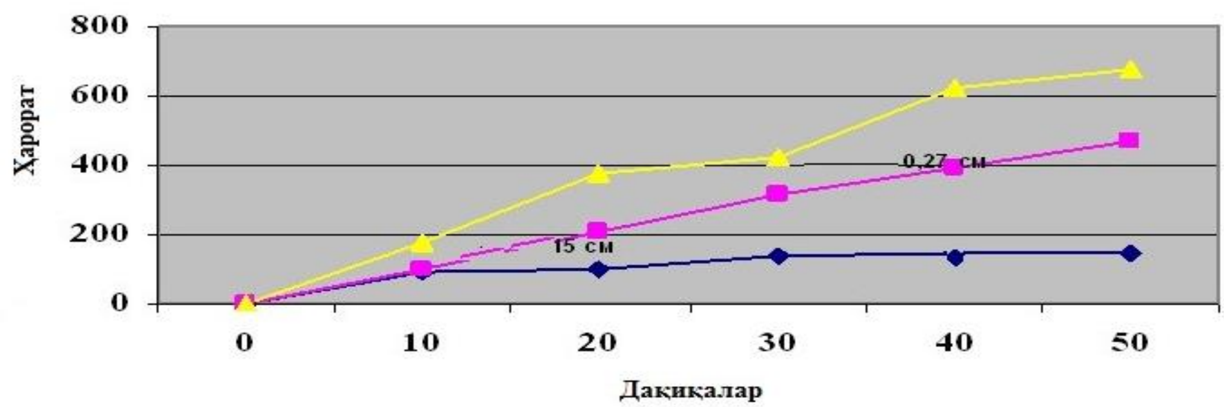

Figure 14. Experimental result of the thermal effect given to the 3rd stage sample.

The fire risk test of building materials revealed that when the composition of the building material was reinforced with wollastonite and vermiculite, sodium liquid glass, this object was maximally more resistant to combined seismic and dynamic effects, if the newly obtained samples had made it possible to test the fire resistance of wooden building material samples. demonstrated that it will. The most efficient fireproofing materials now on the market have been found to be vermiculite and wollastonite. The transition of wood material from the F4 (highly flammable) group to the F1 (low flammable) group was accomplished by applying the developed flame retardant coatings in accordance with the criteria of the state standard.

It was demonstrated over the course of the experiment that the new building materials that have been suggested are quite successful in terms of heat resistance and fire resistance. One of the major scientific accomplishments of the experiments was the use of maple leaf sawdust as the primary component and the fire resistance of wollastonite mineral is 1600-1800^{0}C and the fire resistance of vermiculite mineral powder is 1100-1300^{0}C, which was thought to be extremely important for increasing the scale of production.

Our republic is the first to improve the fire safety of buildings and structures using local mineral raw materials, such as maple leaf shavings, thermo-vermiculite powder, wollastonite mineral, crushed wood shavings, basalt fiber, and sodium liquid glass, according to the findings of the experiments that were

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
under Volume: 3 Issue: 8 in Aug-2022 https://grnjournals.us/index.php/AJSHR

conducted. A significant improvement in the fire resistance of building structures has been made possible by the development of coatings and production processes. Research is being done to further develop the research on figuring out the features of erosion, corrosion, moisture resistance, and water resistance of samples made of maple leaves. Modern heat-insulating building materials allow for the preparation of large-scale prefabricated structures and details, which significantly lowers the cost of environmental protection while also increasing the level of industrialization of the work, reducing the nomenclature of structures and the need for building materials.

References

1. ГОСТ 12.1.044-89 Пожаровзрывоопасность веществ и материалов.
2. ШНК 2.0102-04-Бинолар ва иншоотларнинг ёнғин хавфсизлиги.
3. Дульнев Г.Н. Теплопроводность смесей и композиционных материалов: Справочная книга. Текст. / Г.Н Дульнев, Ю.П. Заричняк Л.: Энергия, 1974. -264 с.
4. Ермоленко В.Д. К исследованию массопереноса в коллоидных телах. Текст. / Ермоленко В.Д. - ИФЖ, 1960. Т.З. - №8. - С. 117-118.
5. Иванников В.П., Клюс П.П., Справочник РТП.-М.: Стройиздат, 1987 г. С. 6.
6. Иванов А.В., Боева А.А., Ивахнюк Г.К., Терехин С.Н., Пророк В.Я. Исследование эксплуатационных характеристик наномодифицированных огнезащитных вспучивающихся композиций в условиях углеводородного пожара на объектах транспортировки нефтепродуктов // Пожаровзрывобезопасность. Научно технический журнал. Том 26. №10. 2017 г. Изд-во ООО «Издательство «Пожнаука». С. 5-17.
7. Иванов А.В., Ивахнюк Г.К., Медведева Л.В. Методы управления свойствами углеродных жидкостей в задачах обеспечения пожарной безопасности // Пожаровзрывобезопасность. Научно технический журнал. Том 25. №9. 2016 г. Изд-во ООО «Издательство «Пожнаука». С. 30-36.
8. Смирнов С.А. Механохимическое модифицирование аммофосав производстве огнетушащих порошков общего назначения /С.А.Смирнов, А.В.Кунин, А.П. Ильин // Химическая технология.– 2010.– №11.– С. 641-645.
9. Беловошин, А.В. Научно-технические предпосылки к созданию огнетушащих порошков, обладающих повышенной огнетушащей и теплоизолирующей способностью / А.В.Беловошин, С.А.Смирнов // Пожаровзрывобезопасность.– 2010.– Т.19. №11.– С. 56-60.
10. Лапшин, Д.Н. Исследование свойств гидрофобизированного моноаммонийфосфата / Д.Н. Лапшин, А.В. Кунин, С.А. Смирнов, А.П. Ильин // Известия ВУЗов. Химия и хим. технология.– 2010.– Т. 53. Вып. 11.– С. 77-80.

ISSN 2690-9626 (online), Published by "Global Research Network LLC"
under Volume: 3 Issue: 8 in Aug-2022 https://grnjournals.us/index.php/AJSHR