Structure-Forming Composition of a Mixture of Rice Husk and Wheat Straw for Thermal Insulation

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- Aliaksandr Bakatovich,
- Florindo Gaspar,
- Nadezhda Bakatovich &
- Zhang Yi

Abstract

Large-tonnage rice husk waste is generated as by-product of the rice milling, and there is a serious environmental problem of rational utilization of this waste. The present study aimed at obtaining a new material based on rice husk for environmentally friendly thermal insulation panels. The second component of the structure-forming composition is wheat straw. The experimental data on the physical properties of thermal insulation slabs included the measurement of density, thermal conductivity, sorption moisture, and compressive strength.

The use of straw in an amount of up to 50% of the total mass of the composition allows to reduce the coefficient of thermal conductivity of insulation slabs to 0.054–0.055 W/(m·K). The thermal conductivity of insulation slabs is due to the microstructure of husk and wheat straw, which is confirmed by the results of electron microscopy obtained in the course of research.

The maximum sorption moisture of rice husk at a relative humidity of 97% has low values of 19.25–19.5%. However, even at a relative humidity of 90%, a fungus appears on the surface of the husk in a relatively short period. For a mixture of husk and straw, the highest water vapor sorption rate of 57% is achieved at a relative humidity of 97%. The presence of modified liquid glass as a binder ensures the absence of fungus with the sorption humidity of the material equal to 40% in conditions of relative humidity of 90%.

Liquid glass ensures the formation of a rigid and durable structural system of thermal insulation slabs, prevents damage to the insulation structure by rodents, and obtains an absolutely safe environmentally friendly thermal insulation composite.

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Author information

Authors and Affiliations

1. **Polotsk State University, Novopolotsk, Belarus**
   Aliaksandr Bakatovich, Nadezhda Bakatovich & Zhang Yi
2. **Centre for Rapid and Sustainable Product Development, Escola Superior de Tecnologia e Gestão, Polytechnic of Leiria, Leiria, Portugal**
   Florindo Gaspar

Corresponding author

Correspondence to Florindo Gaspar .

Editor information

Editors and Affiliations

1. **Centre for Rapid and Sustainable Product Development, Escola Superior de Tecnologia e Gestão, Polytechnic of Leiria, Leiria, Portugal**
   Florindo Gaspar
2. **Centre for Rapid and Sustainable Product Development, Polytechnic of Leiria, Leiria, Portugal**
   Artur Mateus

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