

Thermal insulation material based on reed and straw fibres bonded with sodium silicate and rosin

Aliaksandr Bakatovich^a

Florindo Gaspar^b

Nikita Boltrushevich^c

Polotsk State University, Blokhin str., 29, Novopolotsk 211440, Belarus

CDRSP, School of Technology and Management, Polytechnic Institute of Leiria Campus 2, Morro do Lena – Alto do Vieiro, Apartado 4163, 2411-901 Leiria, Portugal

Nikita Boltrushevich Polotsk State University Blokhin str., 29, Novopolotsk 211440, Belarus

Received 17 January 2022, Revised 24 August 2022, Accepted 1 September 2022, Available online 7 September 2022, Version of Record 7 September 2022.

<https://doi.org/10.1016/j.conbuildmat.2022.129055>Get rights and content

Highlights

- **The use of straw on mixed compositions with reed allows the reduction in thermal conductivity.**
- **Microstructure of the raw plant materials can explain some of the resulting properties.**
- **A technological solution for the method of introducing rosin powder as a binder was developed.**

- Use of liquid glass and rosin allow to reduce the water sorption, as well as the formation of mold.

Abstract

The most used insulating materials have advantageous characteristics for construction, such as low cost, but at the same time, have significant disadvantages such as the environmental footprint. Plant raw materials are a significant reserve for the production of thermal insulation materials in various regions of the world. The results of practical experimental studies indicate promising results on the use of crop waste as a raw material for obtaining thermal insulation materials with high thermal insulation characteristics.

The present study aimed at obtaining a new material based on reed for environmentally friendly thermal insulation panels. Compositions were developed based on mixtures of crushed reed and straw, creating a new method for the introduction of rosin into the aggregate mixture, which ensures even binder distribution, regardless of the amount of thermal insulation material. The electron microscopy readings of the reed and straw structure, revealed the mechanisms that determine the physical properties of insulation. The experimental data on the physical properties of thermal insulation slabs, included the measurement of density, thermal conductivity and moisture sorption. The results show the benefit of replacing reed by crushed straw and of the use of rosin as a binder, achieving a thermal conductivity coefficient of $0.048 \text{ W}/(\text{m}\cdot\text{K})$, with significant impact on the reduction of sorption of water vapor, which allows to conclude that the developed compositions have characteristics that make it promising for application in construction.

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Keywords

Thermal insulation

Thermal conductivity

Rosin

Liquid glass

Reed

Straw

Data availability

No data was used for the research described in the article.

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