Innovative fire- and water resistant cellulose-based material

National Center for Research and Development, III edition of EEA and Norway grants;
The Program 'Applied Research' in the frame of Norway Grants 2014-2021 / POLNOR 2019 (NOR POLNOR/CellMat4ever/0063/2019-00)

PARTNERZY:

Uniwersytet Przyrodniczy w Poznaniu
Poznań University of Life Sciences

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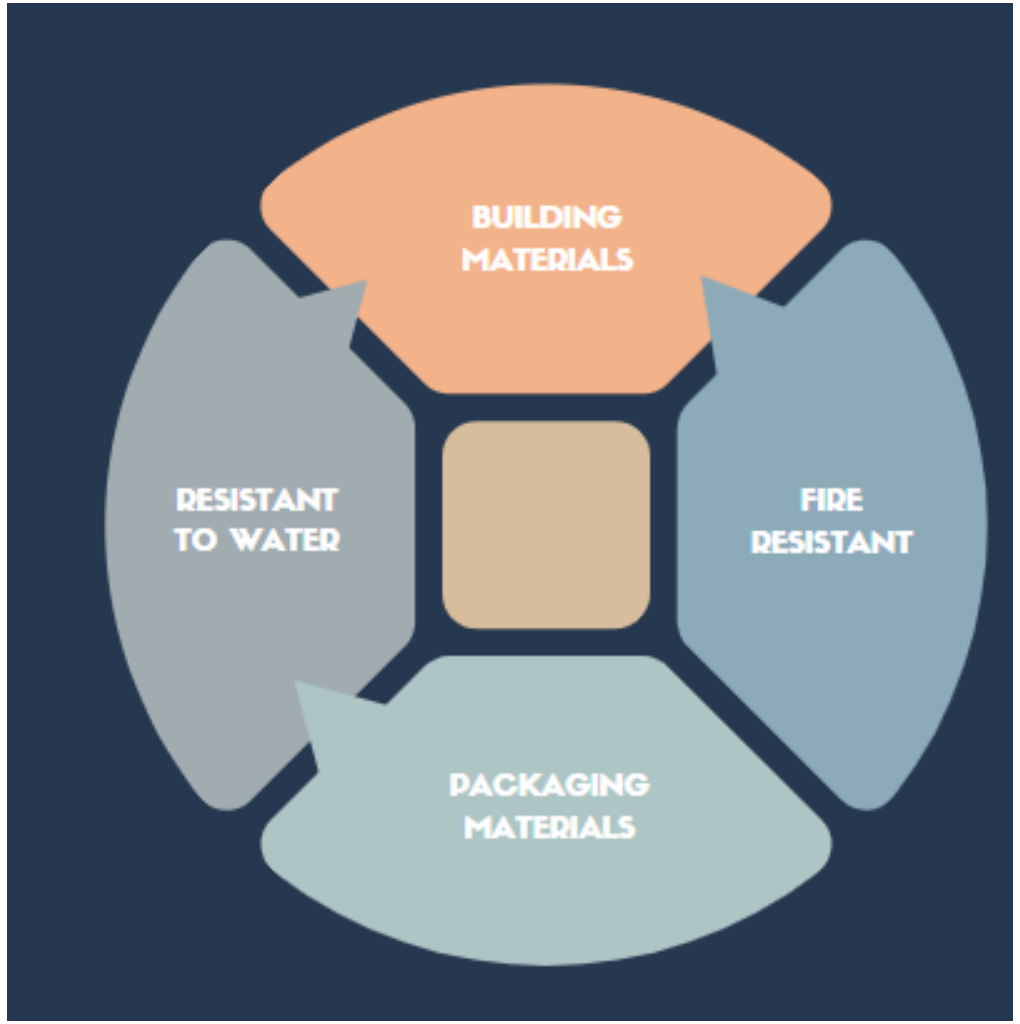
Genesis

1. Thematic areas
    1. Food and natural resources,
    2. Energy, transport and climate,

2. Expected results are:
    1. Enhanced cooperation between the Polish and Norwegian partners;
    2. Technology transfer, sharing experiences and best practices (S2B),
    3. **Development of new products and technologies,**

Aim

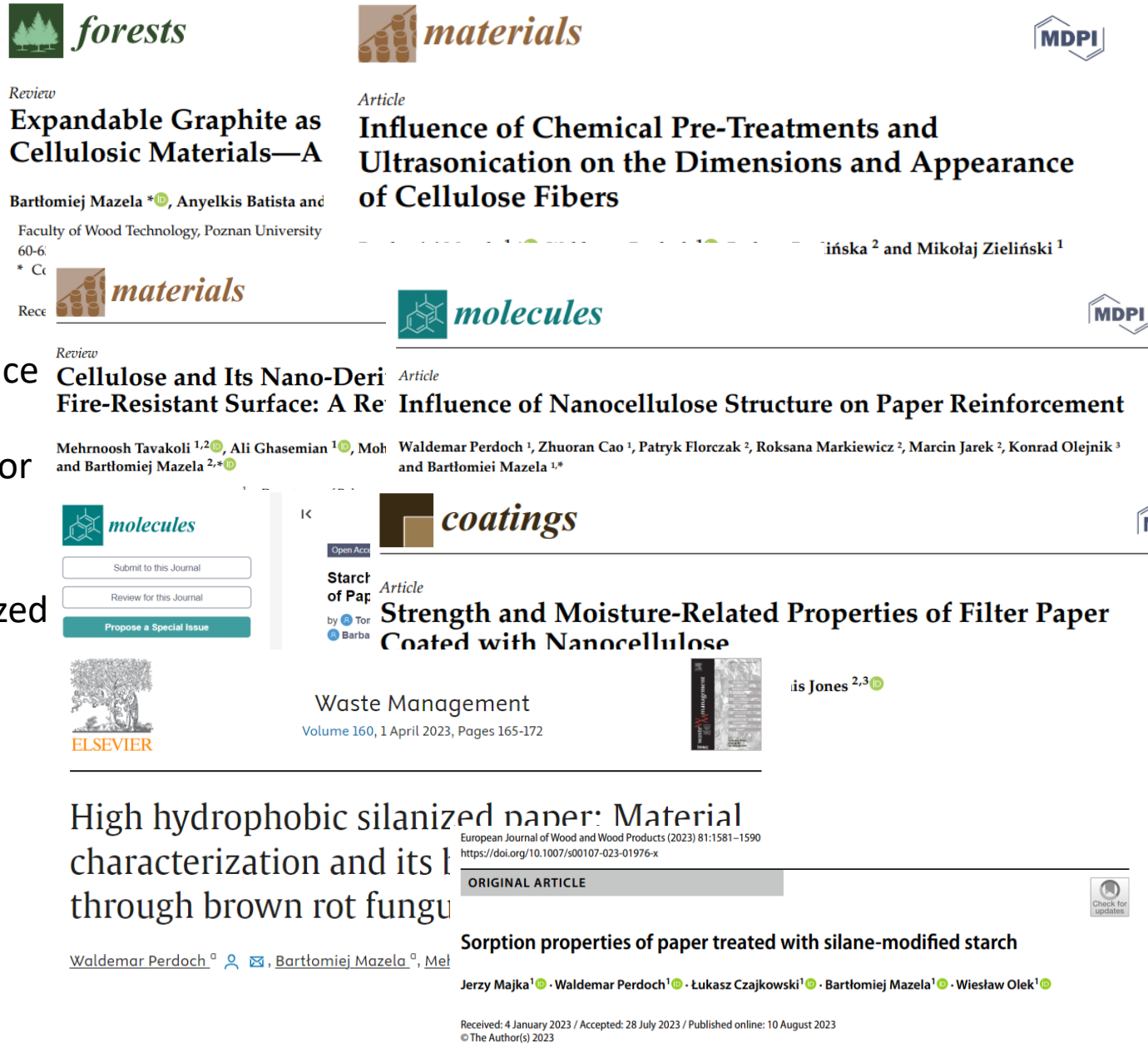
Innovative fire- and water resistant cellulose-based material



Results

1. Hydrophobization of cellulose through silanized starc
2. Panel cellulose composite with increased fire resistance
3. Preparation of biopolymer-based coatings and films for use on cellulose substrates
4. Hydrophobization of corrugated board through silanized starch

cellmat.up.poznan.pl/en/



Hydrophobization of cellulose through silanized starch

Waldemar Perdoch[1], Bartłomiej Mazela[2], Andreas Treu[3] , Tomasz Nowak[4]

Poznań University of Life Sciences, Poznań

Norwegian Institute of Bioeconomy Research, Norway,

Poskładani.pl, Poland,

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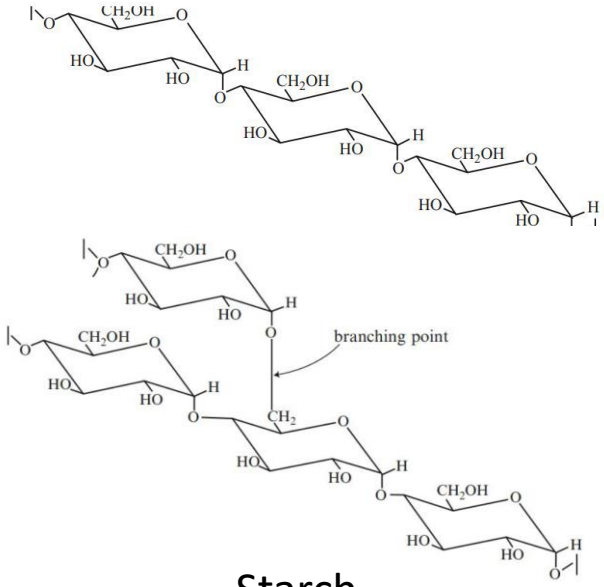
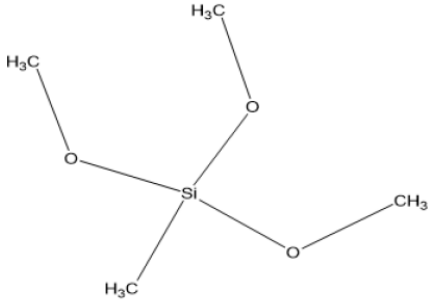
Output

Aim



Starch

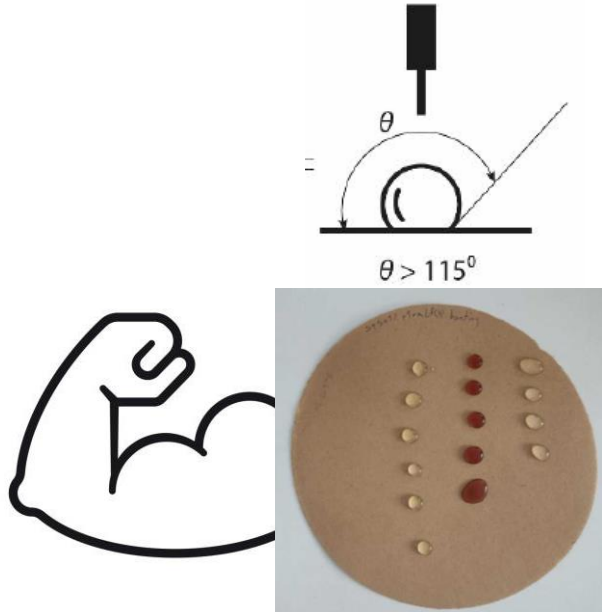


MTMS

Methyltrimethoxysilane CAS 1185-55-3

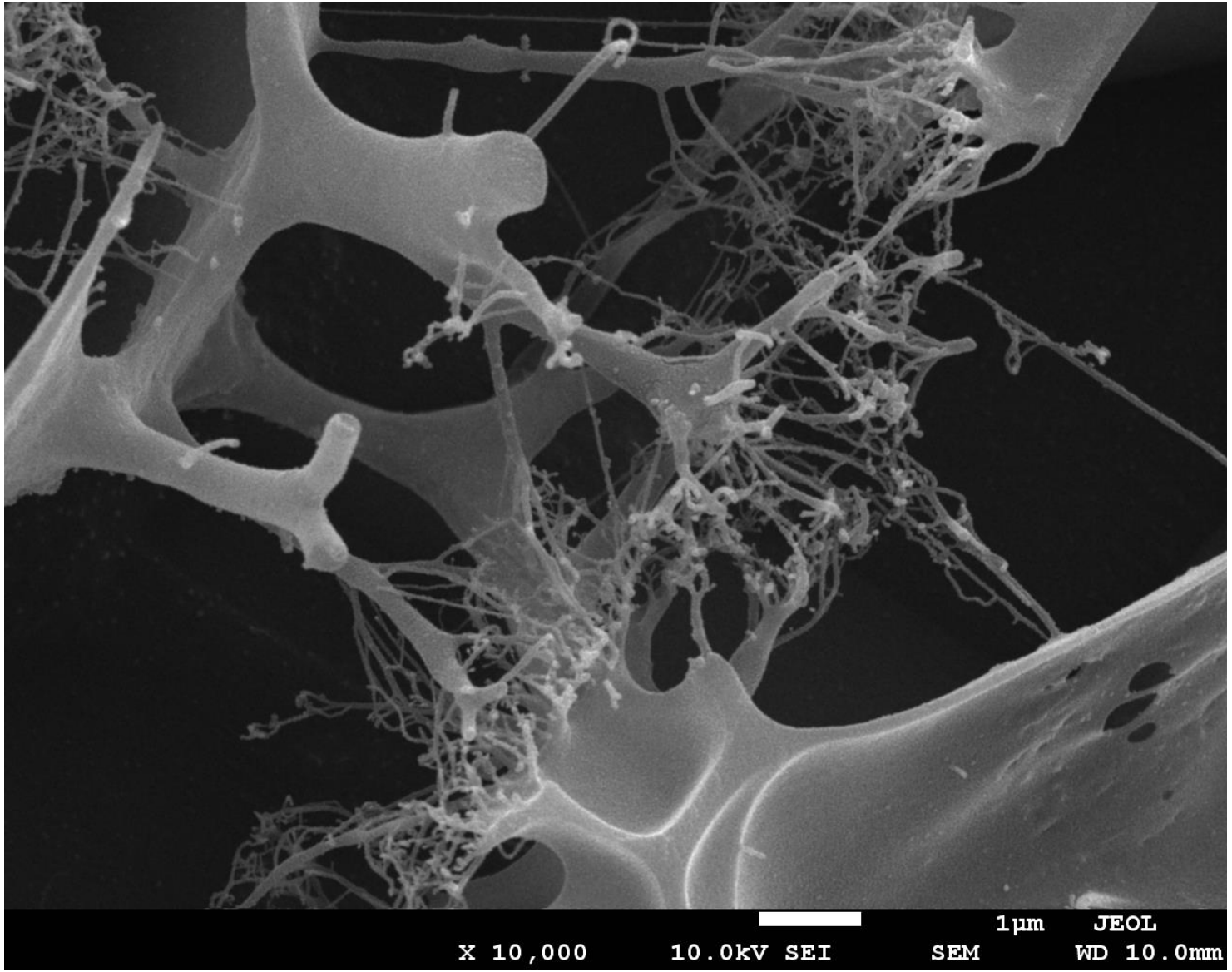
H_20
70°C
pH>8,5

Cellulose fibres



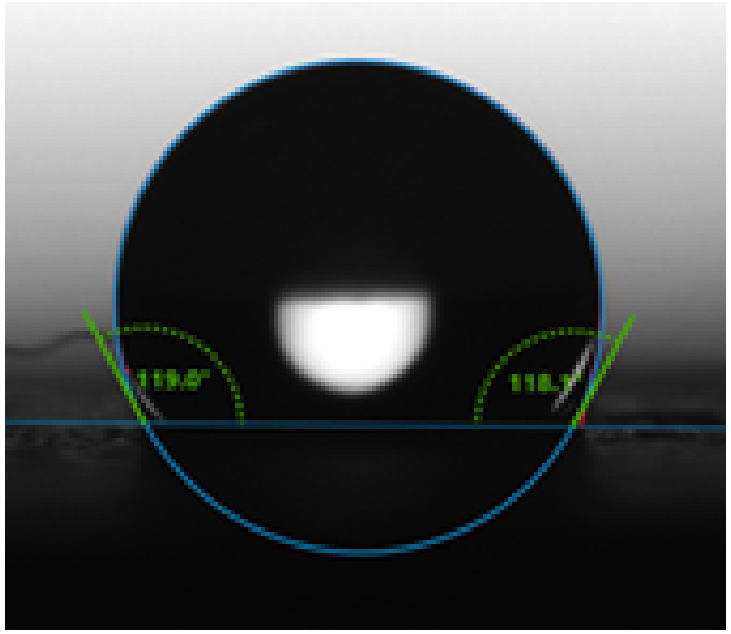
In the study, model papers were produced and hydrophobized in bulk and on the surface through polysaccharides modified with methyltrimetoxysilane (MTMS).

Effect of starch modification – cryo-SEM-EDX

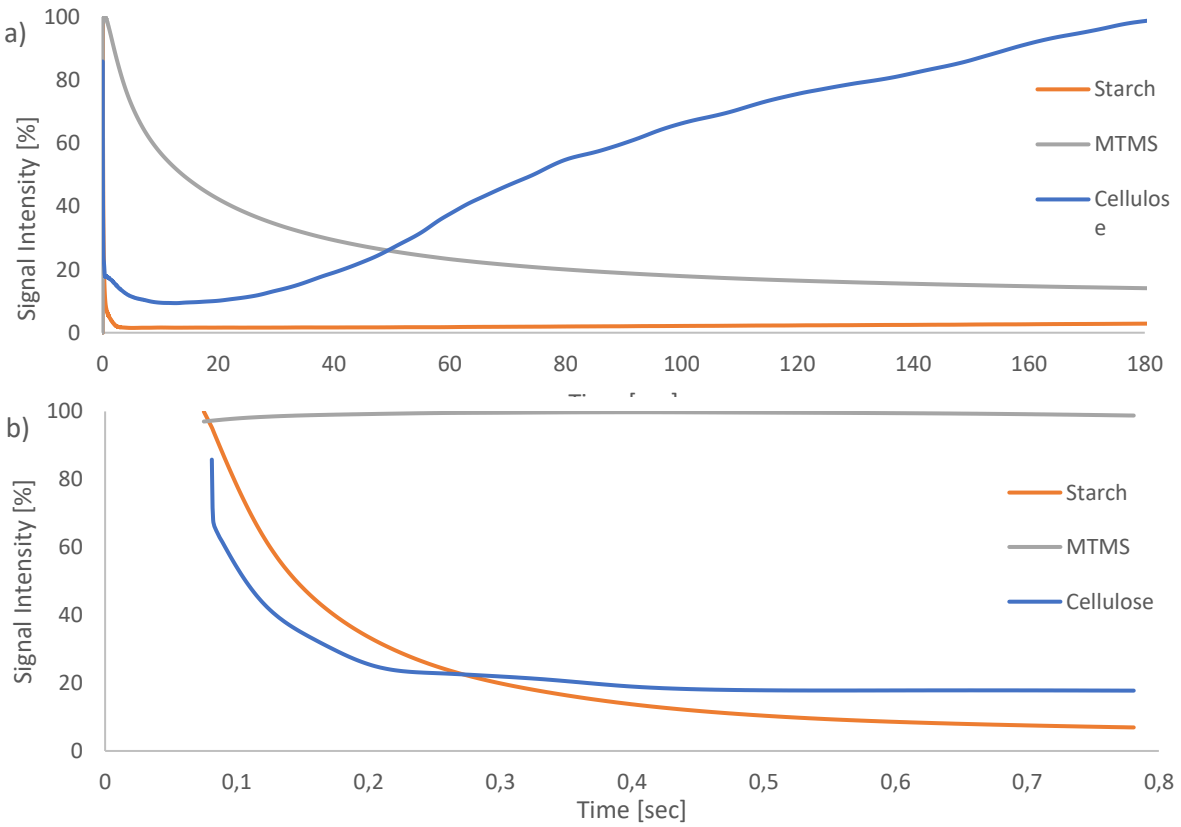


Nowak, T., Mazela, B., Olejnik, K., Peplińska, B., & Perdoch, W. (2022). Starch-silane structure and its influence on the hydrophobic properties of paper. Molecules, 27(10), 3136.

Surface treatment

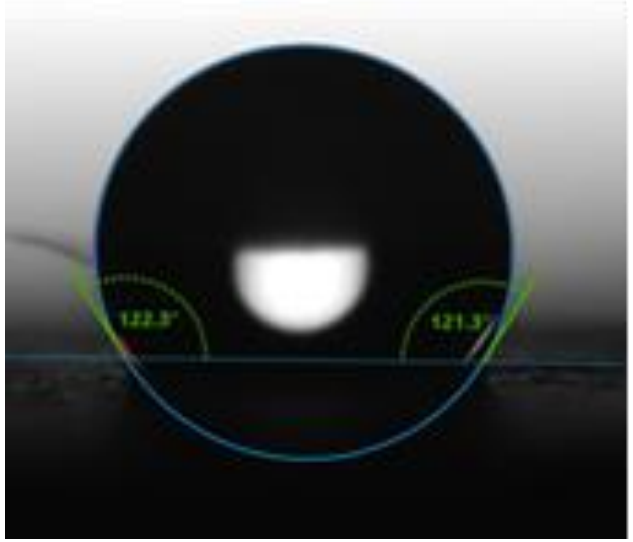


Water contact angle

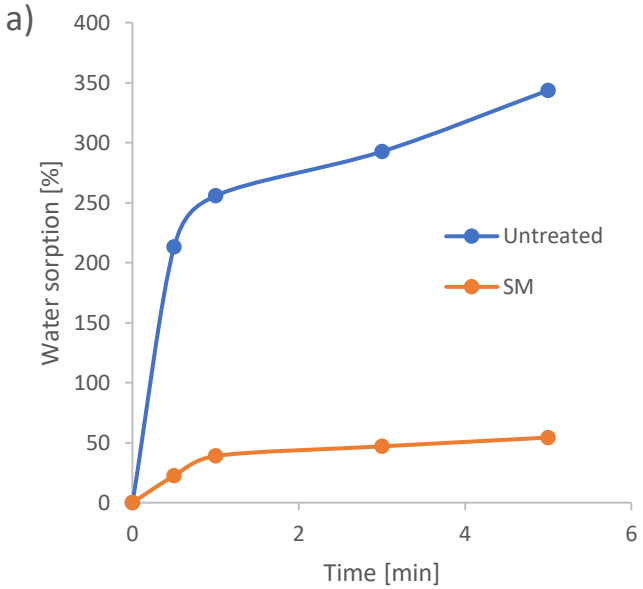


PDA - penetration Dynamic Analysis

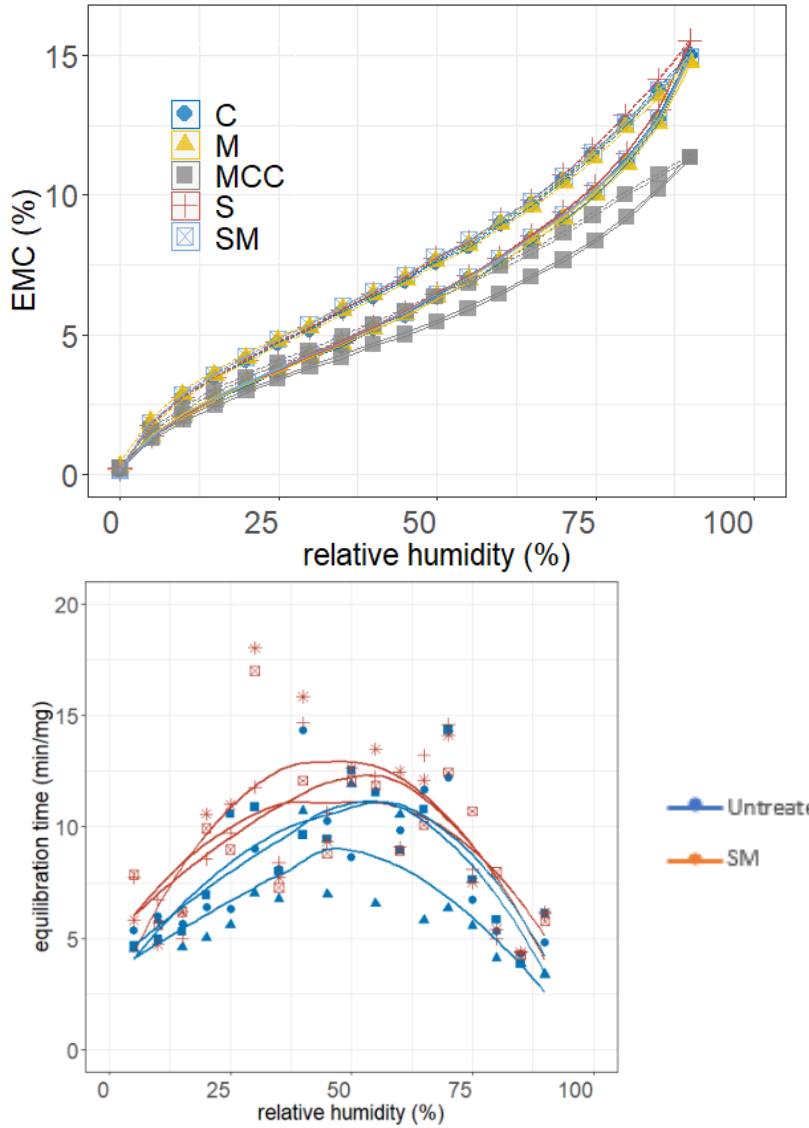
Bulk treatment



Water contact angle

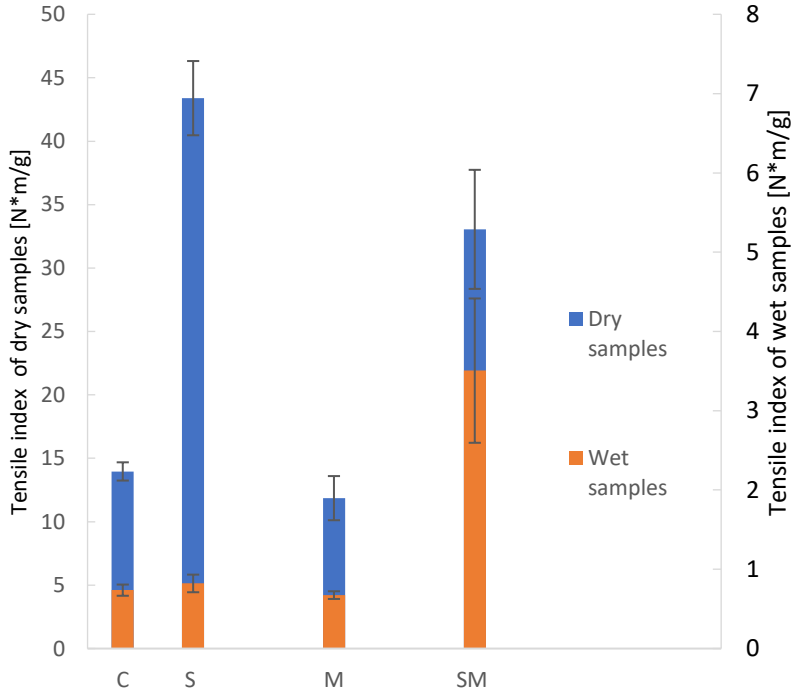


Water uptake



DVS

Bulk treatment



Tensile index

ELSEVIER

Waste Management
Volume 160, 1 April 2023, Pages 165-172

High hydrophobic silanized paper: Material characterization and its biodegradation through brown rot fungus

Waldemar Perdoch [a], Bartłomiej Mazela [a], Mehrnoosh Tavakoli [a b], Andreas Treu [c]

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https://doi.org/10.1016/j.wasman.2023.02.007

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Conclusions

1. Paper material based on cellulose modified with starch silylated through MTMS was highly hydrophobic
2. PDA and WCA analysis confirmed the high barrier properties of the examined material against water.
3. Biodegradation of the material is available after leaching
4. Dynamic vapor sorption of the treated papers was not altered, however, the equilibration time was prolonged.
5. Cellulose with MTMS-modified starch highlighted their high potential as a hydrophobic agent in the paper and packaging industry.

Norway grants

NCBR
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Acknowledgements.
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