

Performance of biocide-free wood coatings modified with silicon compounds

Protection of wood surface should provide protection against physical, chemical and biological attacks, including water, UV-light, living organisms - fungi in particular. In case of wood, such protection is based on the moisture and water permeability and biocidal effect of a coating. Therefore biologically active substances are very important components of wood preservatives and coatings used in exterior application. However, in recent years, environmental requirements, in particular ECOTOX properties, have changed the approach to chemical wood preservatives. One of the promising methods to improve wood surface properties is to use coatings modified with silanes. Wood protection against liquid water is one of the most important functions of silicon compounds. According to current tendency, silanes are safe in use and have a low environmental impact.

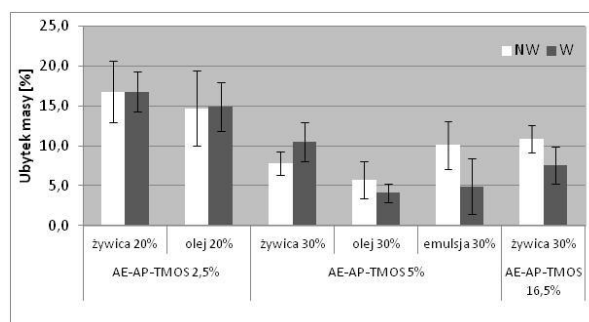
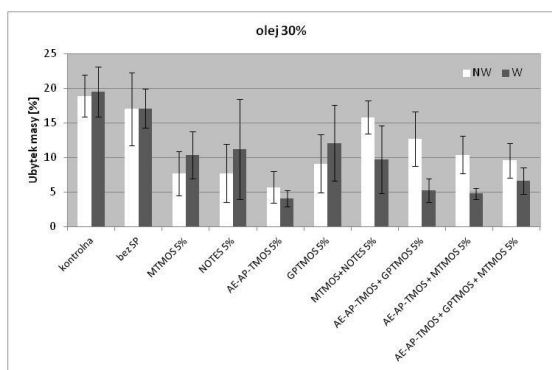
The aim of this research was to assess the impact of selected silanes to improve certain properties of wood and its surface. Experiments were focused on the several following targets: penetration ability, water absorption, durability against weathering, wood destroying fungi and microfungi.

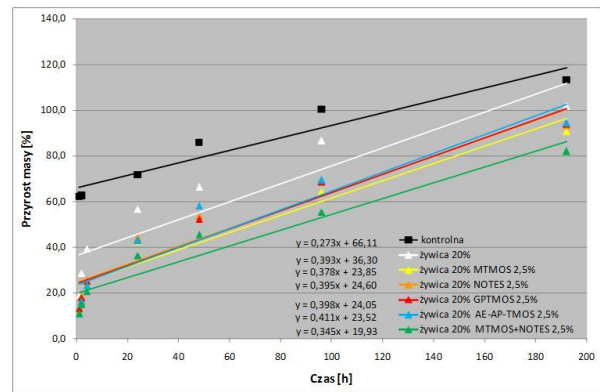
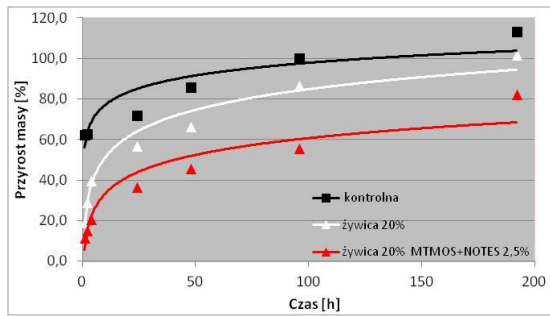
In this study pine wood samples were treated with solvent- and water-borne formulations based on alkyd resin or oil and alkyd emulsions modified with selected silicon compounds. Controls (uncoated samples) and samples coated with formulation without silanes were used as reference samples.

Considerable part of this thesis was investigation of hydrophobicity of wood coatings by measurements of water absorption and contact angle. Durability against wood destroying fungi and molds were based on ENV 839 and ASTM D 5590, respectively. Assessment of aesthetic features like general appearance, gloss degree and colour changes in wood surface completed final conclusions.

The initial investigation of water absorption aimed to demonstrate the effectiveness of hydrophobicity of selected silanes. Formulations enriched with silicon compounds decrease water absorption. Further experiments focused on the resistance to artificial aging. Wood coatings were subjected to water and UV-light for 40h. To determine the effect of artificial weathering, contact angle, gloss degree and colour changes were measured.

The results have shown a certain effectiveness of silicon compounds in surface treatment. Silicon compounds as hydrophobic and harmless agents can be a good alternative to detrimental for environment active substance used in conventional formulations.





Title of project: Potential possibilities to enhance wood durability with the use of organosilanes in wood preservative-decorative formulations

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