Table 1. Amounts of reagents used for preparation of silane solutions
* TEOS - tetraethoxysilane

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SYNTHESIS OF SILANES BASED ON FATTY ACIDS AND THEIR APPLICATION IN CORROSION PROTECTIVE COATINGS

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Introduction

Wood is one of the most important materials in construction industry. Because of its organic constitution, it is slowly destroyed by the long-term impact of water, oxygen and light under atmospheric conditions and hence, needs to be sufficiently protected. Appropriate protection of wood leads to its longer life and hence, huge reduction in maintenance costs. There are several methods to protect wood, either by its chemical modification or by its surface treatment [1,2].

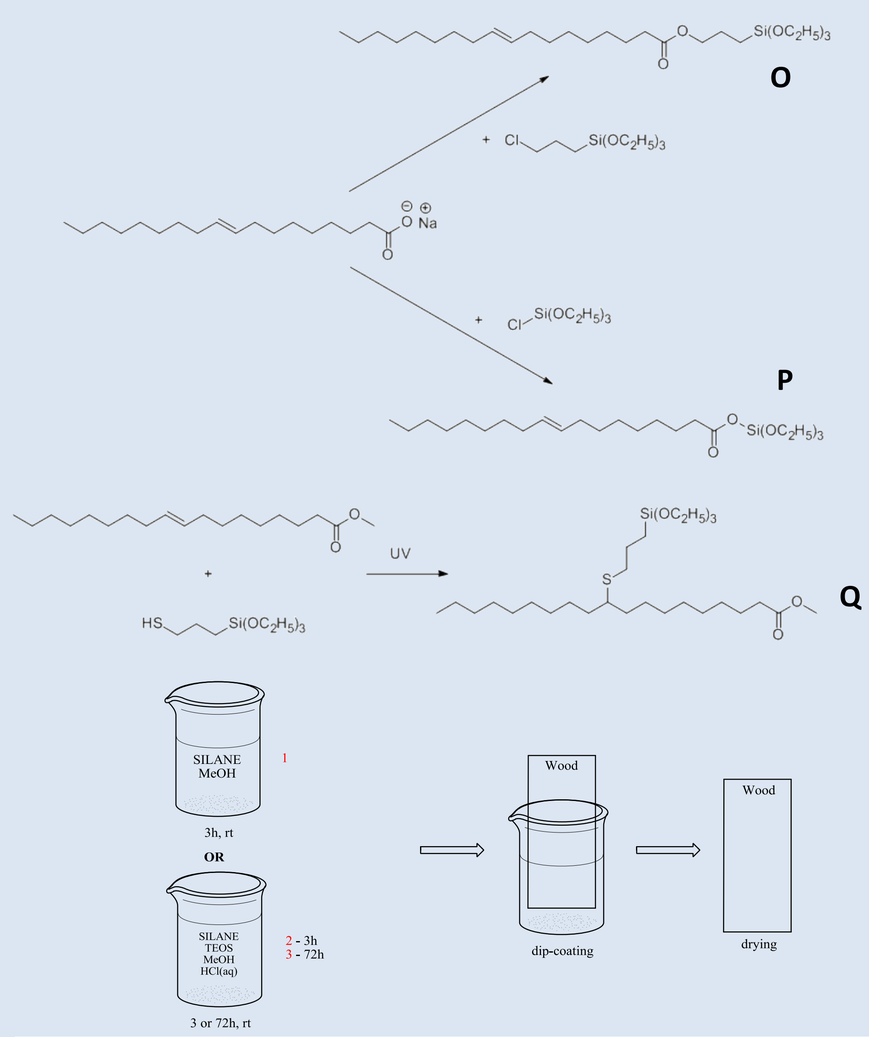
Unfortunately, many of the wood preservatives that have been used so far are highly toxic to humans and hence, much attention has been paid to development of nontoxic materials/methods for the protection of wood [3]. Recently, several reports have been published on the use of inorganic-organic hybrid coating for protection of wood substrates. The sol-gel process to generate hybrid coatings is quite versatile and even allows room temperature deposition of hybrid inorganic-organic films on a wide range of substrates, including wood [4].

Wood surfaces modification with multifunctional alkoxysilanes by sol–gel process is one of promising method to improve and provide new properties for wood materials. The advantage of the sol–gel process is that it allows deposition of thin inorganic–organic layer on various substrates as a result of controlled hydrolysis and polycondensation of alkoxysilanes [5]. The sol-gel coatings created on the wood surface provide barrier properties, moisture control and repellency properties.

References

1. Lambourne, R. ,Strivens, T.A. (Eds), *Paint and Surface Coatings. Theory and Practice*, (1999) Woodhead Publishing
2. Hill, C, *Wood Modification Chemical, Thermal and Other Processes*, (2006) Wiley
3. Materne, T., de Buyl, F., Witucki,G.L., *Organosilane Technology in Coating Applications: Review and Perspectives*, (2012) Dow Corning Corporation
4. Mai, C., Militz H., Modification of wood with silicon compounds. Treatment systems based on organic silicon compounds – a review, *Wood Sci Technol*., 37, 453–461, (2004)
5. Arkles, B., *Silane Coupling Agents*, (2014) Gelest, Inc.

The Functionalized Silanes and Protective Coating Preparation



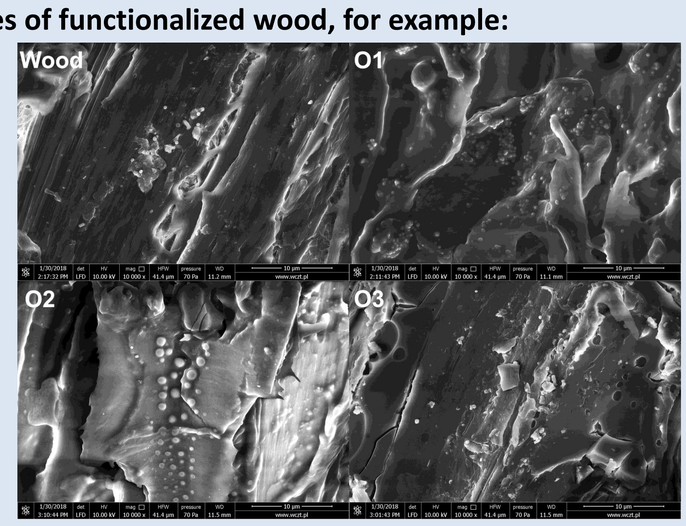
Reagents [g]

Code	**Silane**	Ethanol	Acetic acid	Water	TEOS*
1	5	87	6	2	-
2 and **3**	5	59	6	8	22

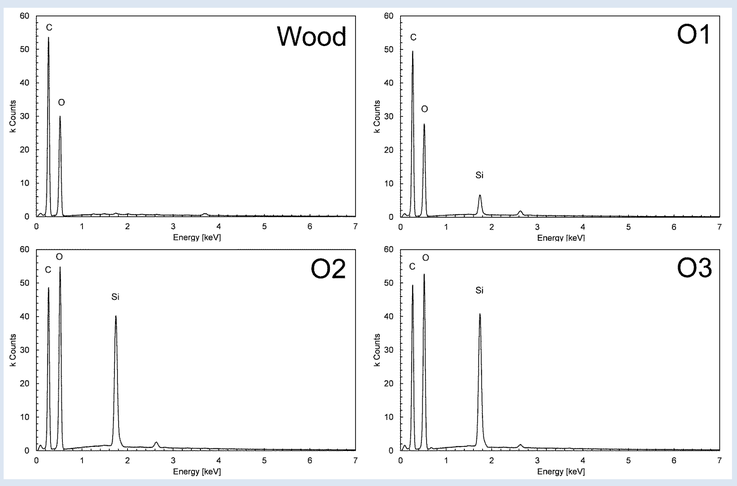
Sample	WCA/degree	Percentage water absorbed/%
Bare wood	55	52
O1	111	13
O2	97	19
O3	92	14
P1	66	23
P2	83	42
P3	75	20
Q1	83	22
Q2	87	32
Q3	89	18

Surface Analysis

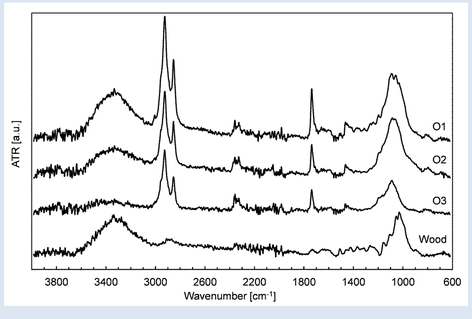
- A SEM images of functionalized wood, for example:

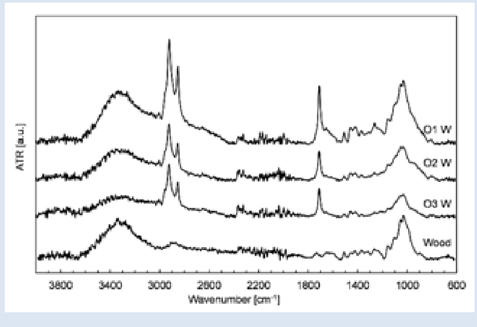


- EDS (*Energy Dispersive Spectroscopy)* analysis of the elemental composition for the functionalized wood



- FT-IR analysis of the wood surface before and after water treatment





Summary

1. Three silylated fatty acids derivatives have been synthesized and used for protective coatings preparation on the woodsurface.
2. Siloxane films have been successfully deposited on the wood samples surface by immersing in the silane solution.
3. Formation of Wood-O-Si bonds between wood surface and silanes have been proven.
4. Synthesis of the silane derivatives of fatty acids opens new possibilities of using natural products for obtaining organosilicon derivatives
5. Two strategies for the intensification of siloxane coating protective properties have been compared.
6. Taking into consideration the results of water contact angle and absorbability measurements , both approaches enable the formation of durable protective coatings.