

The proposal of evaluation of selected thermal-degradation and environmental characteristics of wood modified treatment

Part 1: Determination of selected thermal-degradation characteristics

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Abstract: *The proposal of evaluation of selected thermal-degradation and environmental characteristics of wood modified treatment. Part 1: Determination of selected thermal-degradation characteristics. The aim of the paper is to present a specific proposal for a new experimental and laboratory exercises for the evaluation of thermal degradation and environmental characteristics of the wood and wooden products with different coating applied in prediction of their safe application and simulation for thermal degradation process in terms of burning wood with the identification of the degradation products. In the first part of the article is devoted to the evaluation of the selected thermal-degradation characteristics of attention of solid spruce wood with a covering PUR coatings.*

Key words: wood, surface treatment, thermal-degradation characteristics, model equipment, risk substances

INTRODUCTION

In the field of technical and environmental education is dedicated to maintaining and improving the quality of life and increased attention to the working environment in accordance with current European regulations [1,4] and directives relating to the reduction of dangerous and hazardous chemical substances [1,8] and preparations and evaluation of materials-environmental characteristics of new, environmentally acceptable materials. Just as important, it becomes a question of links obtained theoretical knowledge in conjunction with the monitoring and diagnosis of the environmental attributes of the prepared materials, or hazardous substances emerging in their preparation processes, and the prediction of their safe use [3,7,8].

At present, in the field of technically and environmentally-oriented higher education in the light of the transformation of research results into the learning process in the development of innovative learning materials have been designed and implemented new practical experimental exercises in study programmes and the protection of persons and property from fire, Ecotechnics where students participate along with suppliers on their preparation. Post builds on the design of these modelling exercises referred to in your post [5,6].

EXPERIMENTAL PART

In experimental part students under the expert guidance of teachers of subjects (The technical means of measurement and monitoring, Environmental monitoring, Environmental Analysis, Applied Chemistry, Industrial processes, Technology, Materials) have designed and prepared the test object, which have been used in the experimental measurements of materials-degradation characteristics of the various models of wood products (MDF, OSB, plywood, particleboards, fiberboards and other wood composite materials, as well as solid wood glued) [2] with different surface finishing for the prediction of the behaviour of the

materials used in the wood industry (majority-building applications for the prediction of environmental security) characteristics (using modern detection equipment purchased from the grant project KEGA, No., 023-TUZ-4/2012) in crisis conditions on their use, in particular in case of fire [8].

Experimental methodology is based on the exposure to the test bodies prepared to radiant energy source (the selected ceramic infrasource in the range of 250-1000 W output) for 10 minutes at a distance of 30 mm from the surface of solids. During the course of the entire experiment in 10 second intervals weight loss test records test regular body and Visual phenomena, which occur in his track thermal-degradation decomposition (documented are accompanying photographs). These phenomena are recorded to the time tables for each test individually, and then evaluate the data obtained using the body of mathematics and statistical methods (in Excel and Statistica) [5,6].

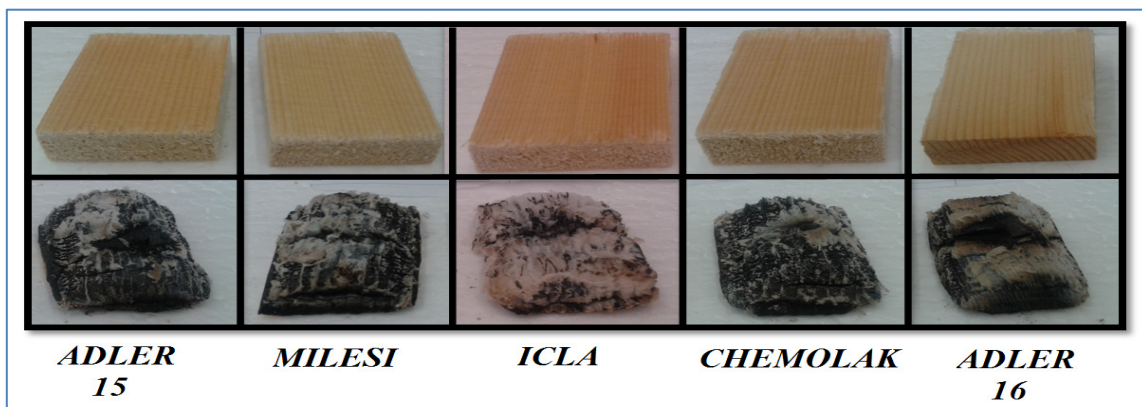


Figure 1. Samples of before the experiment and after thermal degradation

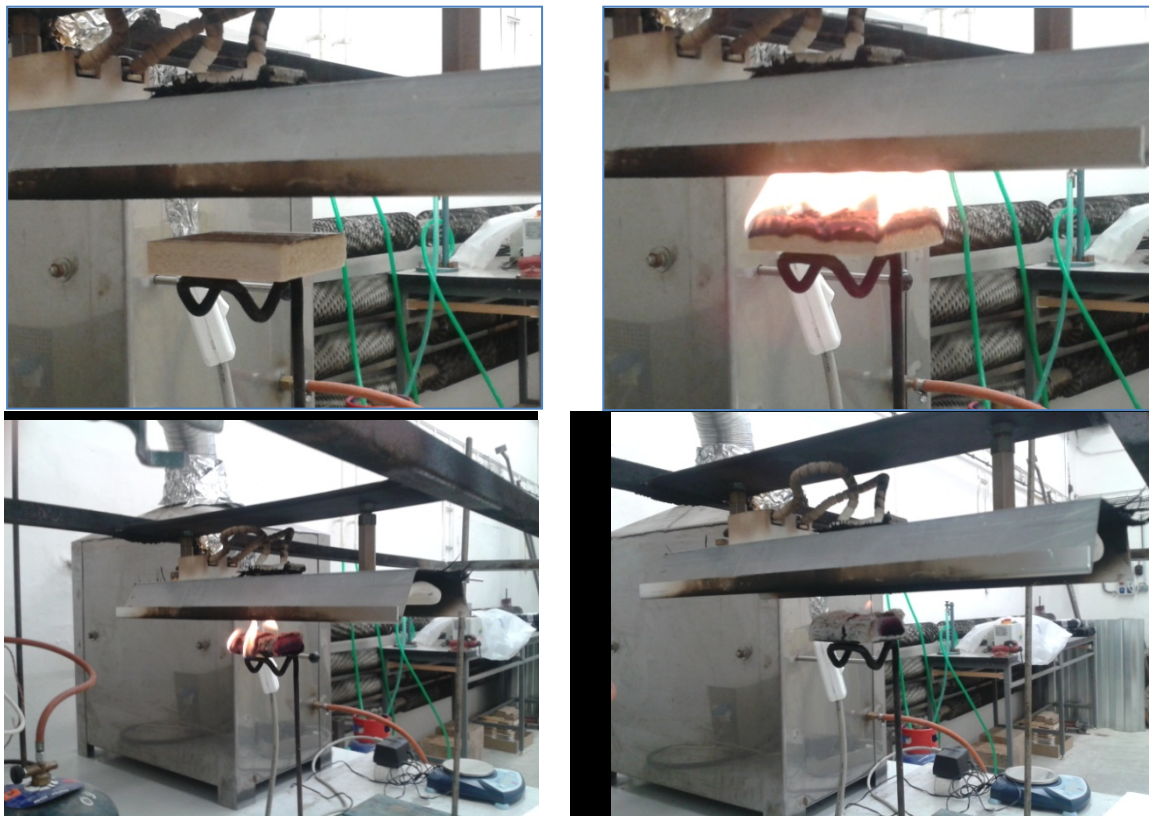


Figure 2. The experimental determination of the thermal degradation of the sample by radiant heat source

In Figure 1. test objects are presented (pine solid wood covered by polyurethane coatings materials for solvent and water soluble and diluent soluble PUR) before the experiment and after thermal degradation (reaction to fire) on the dimensions of 50 (length) x 40 (width) x 17 mm (thickness)[5]. Proposal of the experimental equipment and methodology model of materials degradation characteristics of wood-based materials was detailed in the work [5,6]. In Figure 2 is shown the progress of experimental determination of the thermal degradation of tested samples.

Table 1. Summarized results of the experimental determination of thermal loading samples due to evaluated criteria [3]

Evaluated criteria	Coatings				
	<i>Chemolak</i>	<i>Milesi</i>	<i>Adler 15</i>	<i>Adler 16</i>	<i>Icla</i>
Total loss mass (%)	78,57	81,63	82,29	77,44	87,59
Time of ignition (s)	51	42,4	37,6	32,8	40
Time of combustion (s)	467	472	512	521	324

Evaluated criteria [5] of experimental determination is relative loss mass (%) due to equal (1), next was determined also time of ignition and time of burning (s). Summarized results are shown in the Table 1. And in the Figure 3.

$$\delta_m(\tau) = \frac{m(\tau_0) - m(\tau)}{m(\tau_0)} * 100 \quad (\%)$$

where: $\delta_m(\tau)$ – relatively loss mass (τ) (%); $m(\tau_0)$ – original weight of sample (g); $m(\tau)$ – weight of sample in time (g).

Following the implementation of the proposed experimental measurements and the subsequent processing of the results in Excel, Statistica, graphics and ilustračnej interpretation of the results was a particular kind of wood patterns predikčných draft materials with specified finish to complement the missing fire-technical characteristics of materials in Table 1. of complex assessments.

On the basis of experimental measurements can be evaluated to find that weight loss does not depend primarily on the type of paint substances only, but especially from the underlying material-wood or products made of wood, which was given to the coating substance applied.

After comparing these results with our we have come to the conclusion that Adler had the smallest mass loss in both cases, Adler16, with the difference that the size of the mass loss recorded on the fibreboard (MDF) [5] is less than half of the almost (39,36 %) pine-wood (77,44%) are implying that MDF is much better than pine wood background material.

In terms of time of ignition in both cases was able to resist the radiant heat, according to which the longest Chemolak we can agree with the statement that the coating material provides resistance to radiant heat and substances did not meet the wall only an aesthetic function.

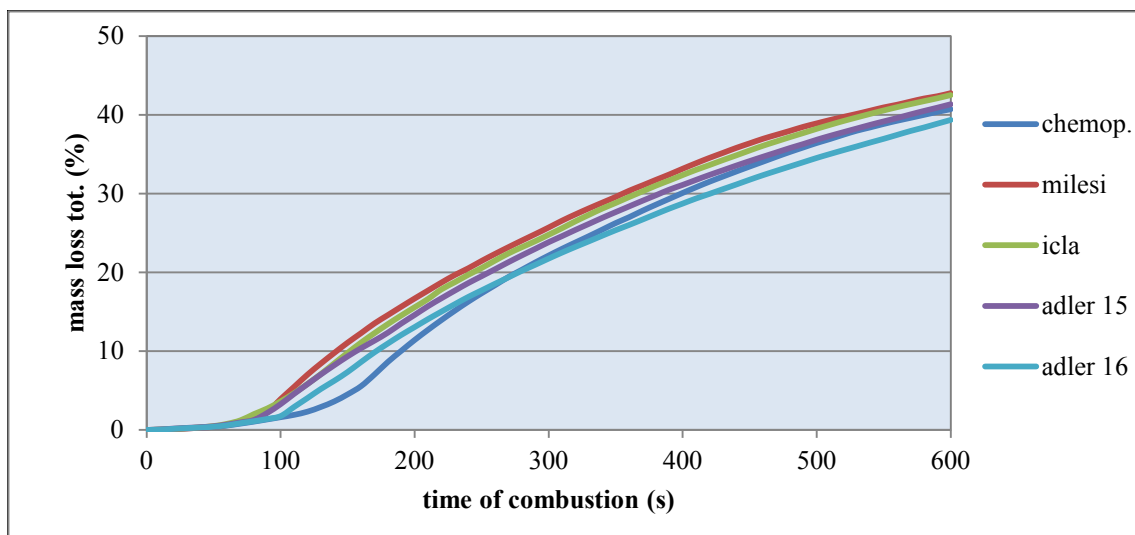


Figure 3. Graphic representation of the total weight loss of all tested samples during the total period of the experiment

CONCLUSION

The article deals with the proposal of evaluation of selected thermal-degradation and environmental characteristics of wood modified treatment by polyurethane (water-soluble and diluent basis) as a new experimental and laboratory exercises for the evaluation of thermal degradation and environmental characteristics of the wood and wooden products with different coating applied in prediction of their safe application and simulation for thermal degradation process in terms of burning wood with the identification of the degradation products.

From the measured and evaluated the results, it is clear that the proposed experimental report and modified the methodology for setting the characteristics of the surface-treated wood make up the lack of knowledge of the degradation of selected for comprehensive evaluation of the materially-degradation and consequently the environmental characteristics of the various materials on the basis of wood with retardants or protective coatings.

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Streszczenie: *Propozycja oceny degradacji termicznej i oceny środowiskowej. Część I. Ocena charakterystyki degradacji termicznej.* Celem pracy jest prezentacja propozycji nowych metod laboratoryjnych do oceny degradacji i charakterystyk środowiskowych drewna i wyrobów drewnopochodnych z różnymi powłokami. Powłoki naniesione zostały z myślą bezpiecznej degradacji termicznej i identyfikacji produktów spalania. Pierwsza część pracy jest poświęcona rozkładowi termicznemu drewna świerkowego z powłokami poliuretanowymi.

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