THE ROUGHNESS OF THE COMPOSITE CHIPBOARDS PLATED WITH ALUMINUM FOIL (PAL-Al)

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ABSTRACT:
THIS PAPER PRESENTS THE RESULTS OF A EXPERIMENTAL RESEARCH ON THE ROUGHNESS OF THE COMPOSITE CHIPBOARDS PLATED WITH ALUMINUM FOIL.
EXPERIMENTS WERE CONDUCTED IN THE LABORATORY OF TESTING OF THE PROCESSING ACCURACY OF THE FACULTY OF WOOD ENGINEERING, BRASOV.
THE ROUGHNESS MEASUREMENT WAS PERFORMED ON THE CHIPBOARD (PAL) WITH FINE FACES, CHIPBOARDS PLATED WITH ALUMINUM FOIL ON BOTH SIDES (PAL-AL) AND ALUMINUM FOIL (FAL). THE STUDY WAS PERFORMED BY MEASURING THE ROUGHNESS THROUGH STYLUS METHOD (BY CONTACT). THE RESULTS OBTAINED HAVE SHOWN THAT THE METHOD WITH CONTACT GIVES MORE ACCURATE DATA, BECAUSE IN THE CASE OF CONTACT LESS METHOD, OCCURS THE REFLECTION PHENOMENON OF THE RADIUS, AND THIS LEADS TO MEASUREMENT ERRORS.

KEY WORDS: CHIPBOARDS, ALUMINUM FOIL, ROUGHNESS, STYLUS METHOD.

INTRODUCTION

Chipboards plated with aluminum foil (PAL-Al) are composite products stratified, which consists from a support (PAL), plated on one or both sides with aluminum foil, glued with an adhesive by a hot-pressing process.

The surface quality is defined through the dimensional accuracy of the geometric shape and through the smoothness (or roughness) degree. The roughness, at its turn, can be expressed through several measurable parameters, such as the arithmetical mean deviation Ra, the maximum profile height Rz and others.[2]

The article is part of a larger research paper and is a part of this research, representing the paper of doctoral thesis ”The Technology and the Characteristics of the composite chipboards plates with aluminum foil”.

METHOD, MATERIALS AND APPARATUS

Because there is no normative for this type of plates, the roughness of the composite chipboards plated with aluminum foil was determined in accordance with SR ISO 4287:2000 “Specificaţii geometrice pentru produse (GPS). Starea suprafeţei: Metoda profilului. Termeni,

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[2] Brenci, L.; Cismaru, Ivan.; Boieriu, C., “Rugozitatea suprafeţelor lemnoase interpretată prin utilizarea a două metode de măsurare”, *Pro Ligno*, vol. 4, nr. 3, p. 67-75, 2008.

definiţii şi parametri de stare a suprafeţei". (Geometrical Product Specification (GPS). Surfaces Texture: Profile Method. Terms, definition and surface texture parameters) and of specific documentation. [3, 4]

The roughness measurement was performed on the chipboard (PAL) with fine faces, chipboards plated with aluminum foil on both sides (PAL-Al) and aluminum foil (FAl).

Interpretation of the results was performed for the three samples, for each of them, being performed five measurements per sample, value interpreted representing the average of the readings obtained.

According to the specifications in reference literature and the other documents which specify the required modality of monitoring the environment conditions, the samples to be measured must be kept and measured at the temperature of de 20 ± 2^0C and the relative air humidity of 50-65%.[5]

The measurement equipment of the roughness located in the endowment the laboratory of testing of the processing accuracy from the Faculty of Wood Engineering Brasov, working in accordance with SR EN ISO 4287:2000.

The measurement of the PAL, PAL-Al and FAl should be performed by the method with contact, because in the case of contact less method (using a roughness apparatus with laser beams), appears the phenomenon of reflection of the radius, which induce measurement errors.

The equipment used to measure the roughness was roughness apparatus with stylus, PS1 type.

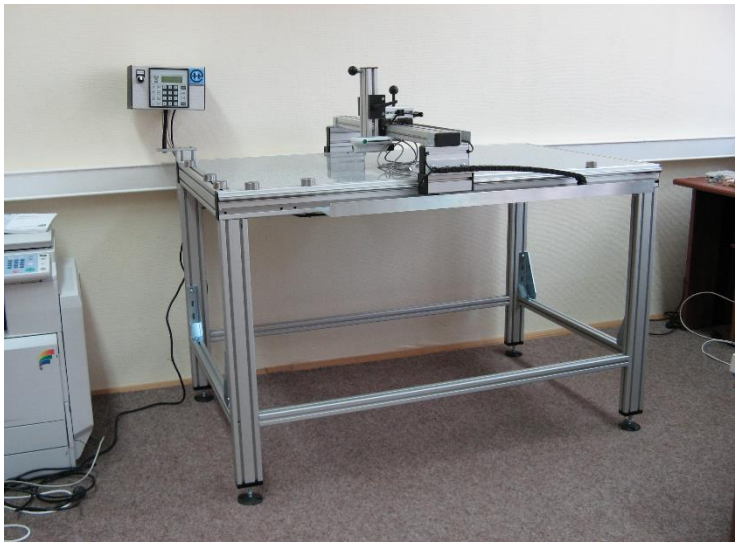


Fig. 1: Roughness apparatus with stylus (by contact)

The measuring by mechanical contact is achieved by moving the stylus in longitudinal direction along a previously established distance, according to standard specifications:

-analyzed length: Lt=5,6mm;

-length to be removed from the two ends of the measured line, in order to eliminate eventual distorsions: L_C=800µm.

[3] ***SR EN ISO 4287 (2003) Specificaţii geometrice pentru produse (GPS). Starea suprafeţei: Metoda profilului. Termeni, definiţii şi parametri de stare ai profilului.

[4] Galeru, Daniela Mariana; "Research on physical, mechanical and technological characteristics of the composite chipboards plated with aluminum foil (PAL-Al)", *Revista Creativitate şi inventică*, Nr. 4, 007, 2012.

[5] ***SR EN ISO/CEI 17025 (2005), Cerinţe generale pentru competenţa laboratoarelor de încercări şi etalonări.

The results of the stylus measurements were saved in reports which display the graph of analyzed surface, as well as the value Rz (maximum profile height).

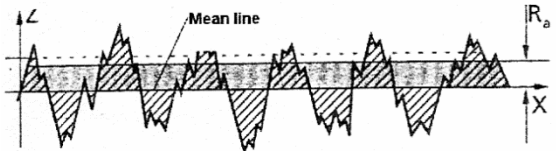
Out of the parameters defined by ISO 4287:2001 Ra and Rz were used.

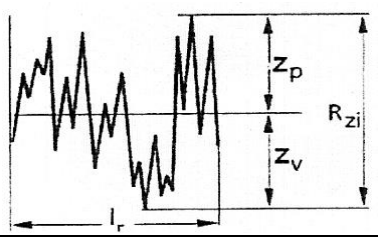
The parameter Ra, even being considered the most common and useful roughness parameter for the surfaces quality evaluation, does not offer enough data about surfaces roughness, and thus, it must be attended by other parameters, as well. Rz is more sensitive than Ra.

The roughness parameters are presented in Table 1.[6]

Table 1

Roughness parameters under study for PAL, PAL-Al and FAl

Roughness parameter	**Description**	**Representation**
0	**1**	**2**
R_a, µm	The arithmetical mean deviation-Ra-is the arithmetic mean of the absolute ordinate values Z(x) within a sample length.	

0	**1**	**2**
Rz (ISO), µm	The maximum profile height-Rz-the sum of height of the largest profile peak height, Z_P and the largest profile valley absolute depth, Z_V within a sample lenght.	

EXPERIMENTAL RESULTS

Table 2 presents the values of roughness Ra and Rz for PAL, PAL-Al and FAl, measured by stylus method (by contact).

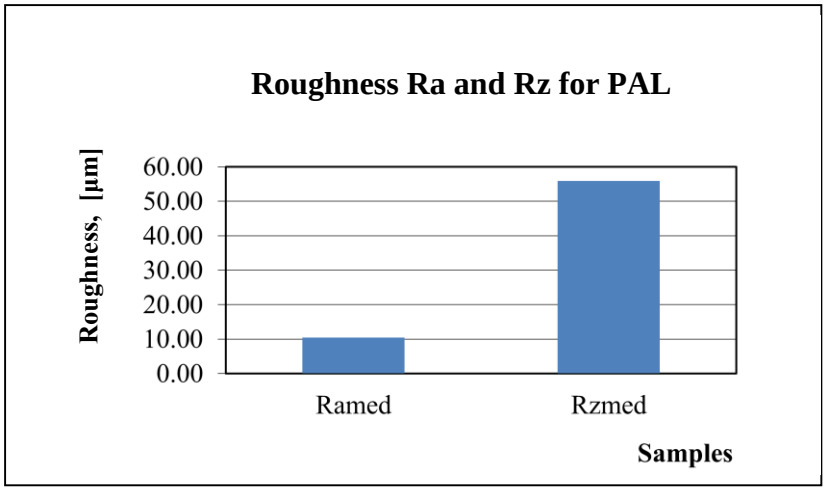
Table 2

Roughness Ra and Rz, for PAL, PAL-Al and FAl, measured by stylus method

Measuring points	Roughness, [µm]					
	R_a			Rz		
	PAL	FAl	PAL-Al	PAL	FAl	PAL-Al
1	9,177	0,112	0,118	49,70	0,80	0,60
2	10,470	0,157	0,102	52,70	0,86	0,84
3	12,010	0,104	0,103	58,80	0,71	0,91
4	10,020	0,123	0,127	52,40	0,11	0,91
5	10,460	0,163	0,109	61,50	1,22	0,85
	Ra_{min}=9,177	Ra_{min}=0,104	Ra_{min}=0,102	Rz_{min}=49,70	Rz_{min}=0,11	Rz_{min}=0,60
	Ra_{max}=12,010	Ra_{max}=0,163	Ra_{max}=0,127	Rz_{max}=61,50	Rz_{max}=1,22	Rz_{max}=0,91
	Ra_{med}=10,427	Ra_{med}=0,132	Ra_{med}=0,112	Rz_{med}=55,92	Rz_{med}=0,74	Rz_{med}=0,82

[6] Salcă, Emilia Adela; Fotin, Adriana; Cismaru, Ivan; "Evaluarea calităţii suprafeţei la frezarea profilată a lemnului de arin şi mesteacăn", *Pro Ligno*, vol. 4, nr. 2 p. 57-68, 2008.

Fig. 2 presents the average values of roughness Ra and Rz for PAL, PAL-Al and aluminum foil measured by stylus method.



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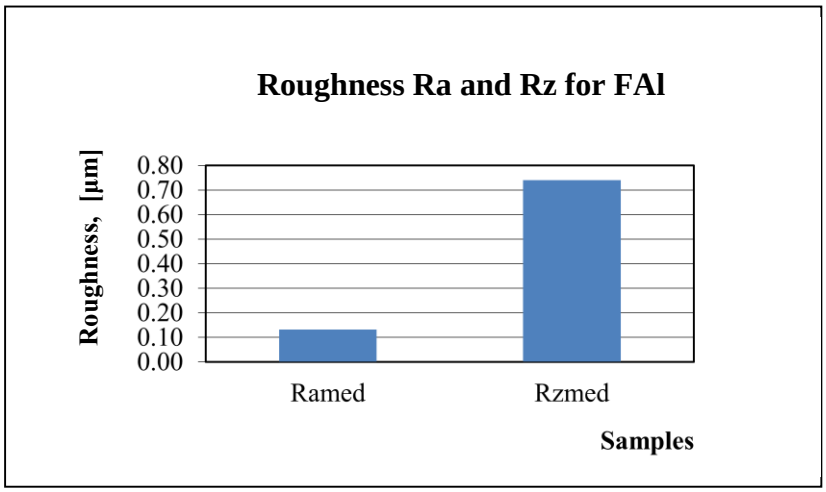

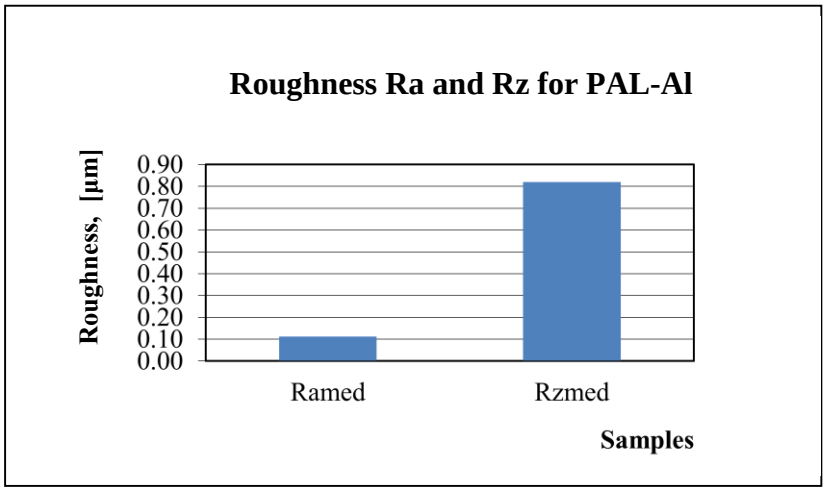

c

Fig. 2: Graphical representation of roughness Ra and Rz for PAL (a), PAL-Al (b) and FAl (c), measured by stylus method.

CONCLUSION

A special attention must be considered regard in calibrating chipboard, in order to a roughnesses how more reduced. Calibration by grinding must not modify the structure symmetry of the chipboard.

The roughness of the plates PAL-Al is a consequence of the other two roughness (PAL and FAl).

The roughness of the plates PAL-Al (parameters Ra and Rz) are net superior than PAL.

PAL has the average value of the roughness Ra of 10,427 μm, and when is added the aluminum foil, is obtained plate PAL-Al with the roughness Ra of 0,112 μm, so fell with 98.92 %.

The plates PAL-Al have a low roughness, due to roughness the chipboard, roughness the adhesive film and of pressing regime (Table 2).

From the analysis presented was observed that the surface of the plates PAL-Al has a superior quality, expressed by lower values of the parameters compared to PAL type standard.

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