EFFECT OF SURFACE PREPARATION ON THE STRENGTH PROPERTIES OF THE JOINT BETWEEN CAST EPOXY RESIN AND SOLID WOOD

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INTRUDUCTION

The paper deals with the effect of surface preparation on the strength properties of the bond between cast epoxy resin and solid wood, which is currently a popular technology in the production of aesthetically different parts with a unique appearance. Due to the complexity of the production technology of these parts, this type of joining also translates into a higher sales value of the products, which puts emphasis on ensuring and verifying the quality parameters of the joint. There are various techniques for preparing the surface of the wood that can significantly affect the strength properties of the final joint. When in this paper, traditional methods representing sanding and brushing will be compared with more modern approaches such as surface preparation using dry ice or dry snow. Surface preparation is crucial due to the influence of many factors that affect the strength characteristics of the joint, including the adhesion of materials and their resistance to mechanical loading [1].

MATERIALS AND METHODS

Meranti wood was chosen for testing the strength properties of the joint, with samples having a moisture content in the range of 8-10%. The bonding material used was a casting epoxy resin from a foreign manufacturer, which is prepared in a ratio of 1 part resin (A) to 2 parts hardener (B). The curing time of the system is 5 days and the subsequent curing time is 21 days; this system can be cast to a thickness of 10 cm. This system was designed with a long gelation time in a block with low exothermic heat accumulation. It is VOC free to increase safety and reduce environmental impact. The specimens were treated with the given surface preparation, at conditions for brushing 1200 rpm, grinding with an eccentric grinder of roughness P80 and for spraying with dry snow a combination of conditions of 6 bar at a volume of 30 kg in 1 h was chosen. The samples were cast in larger formats and then, after a curing and maturation period, cut to 10 x 20 x 100 mm, where the part cast with epoxy resin has a cross section of 10 x 20 mm and a thickness of 20 mm and is located in the middle of the sample. The specimens prepared in this way were further subjected to a tensile strength test based on the principles of the tests of EN 205 (668508) and EN 1465 (668510), where the specimens were clamped in the clamps as they would be loaded in use. FTIR analysis was also performed on the surface of the cured casting epoxy resin on samples treated with dry snow. these results were compared with surface grinding to determine the effect of this preparation on the final properties of the cured casting epoxy resin.

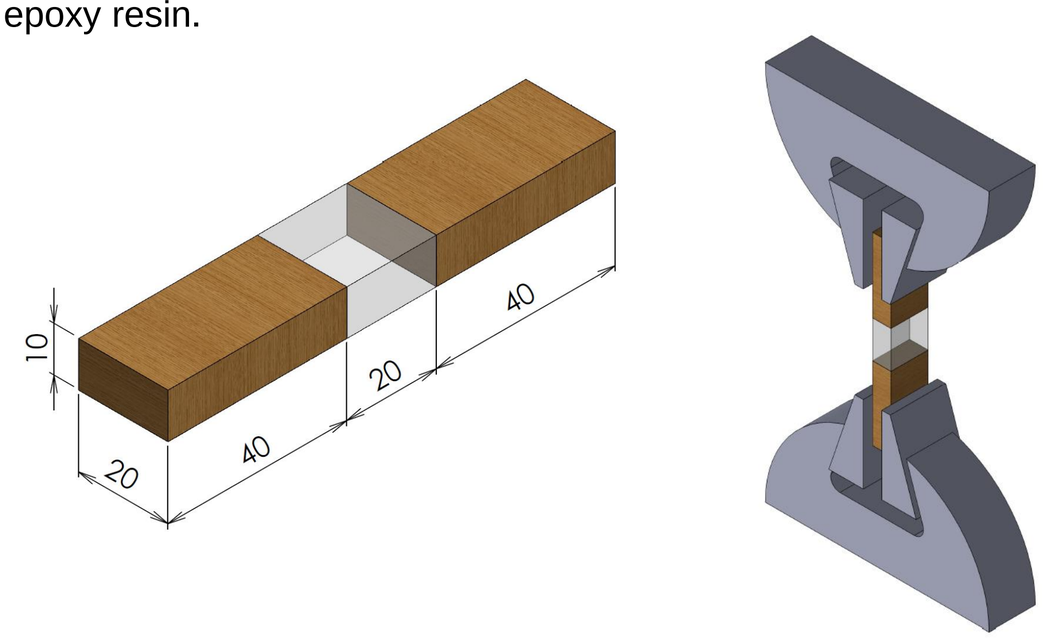

Fig. 1 Dimensions of samples

RESULTS AND DISCUSSION

Figure 2 shows the statistical evaluation of the measured tensile strength values for the specimens to which different surface preparation methods were applied. The results show statistically significant differences between specimens prepared by the dry snow blasting method compared to traditional methods such as brushing and grinding. For the specimens where dry ice surface preparation was used, there was an increase in bond strength. The average tensile strength values for each method were as follows: brushing 6,75 MPa, grinding (P80 roughness) 7,74 MPa and dry snow blasting 11,14 MPa. No defects were observed in any of the samples in the form of a violation of the cohesive properties of the casting epoxy resin, confirming the cohesiveness of the material after curing. Figure 3 shows the results of Fourier-transform infrared spectroscopy (FTIR) analysis of the surface of the cured casting epoxy resin compared to the ground material. The analysis reveals differences in the surface properties of the cured resin, which may affect the adhesive behavior of the joint.

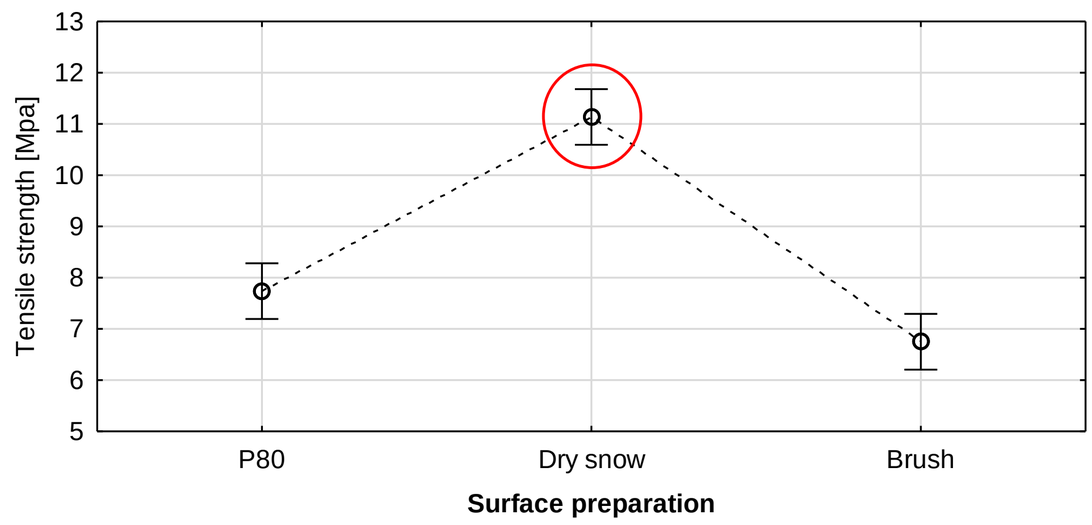

Fig. 2 Comparison of the effect of surface preparation on the tensile

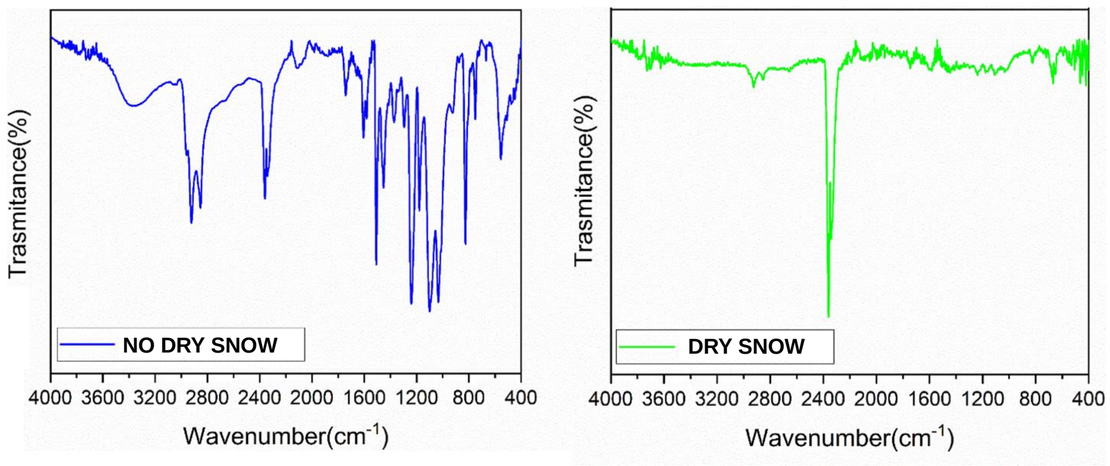

Fig. 3 Results of the FITR

CONCLUSIONS

From the results obtained, it can be concluded that both traditionally used surface preparation methods, namely brushing and grinding, and more modern techniques such as dry snow blasting are suitable for this type of connection. The modern method of dry snow blasting, although less widespread in the furniture industry, makes it possible to achieve higher tensile strength values while providing interesting aesthetic surface variation. The results also showed that the resulting surface texture prepared by modern methods differs from traditional techniques, in particular sanding. It can therefore be concluded that, under the specified conditions, all tested surface preparation methods are suitable for use in this type of connection, and each method offers specific characteristics in terms of both strength and aesthetic parameters.

REFERENCES

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