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STUDY ON THE MECHANICAL PROPRIETIES OF COMPOSITE PANELS BASED ON FIBER GLASS IMPREGNATED WITH DIFFERENT BINDING AGENTS

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Abstract: *In the mechanical research of composite materials with fiber glass we explore the properties and behavior of these materials under varied conditions from static loads to dynamic ones. The composite materials for the tests are created by combining two or more components with different properties to achieve superior performance to individual components. A crucial aspect of the research is understanding the mechanical behavior of these materials under different loading conditions. Mechanical tests include tensile tests, compression, bending and bending to evaluate the strength and stiffness of the composite. In plus, impact tests can be performed to determine the material's ability to absorb energy during sudden charging. These tests provide essential data for optimization design and engineering of composite materials.*

Keywords: *composite panels, bending tests, hemp-based composites, fiber glass*

1. INTRODUCTION

In the mechanical research of composite materials with fiber glass we explore the properties and behavior of these materials under varied conditions from static loads to dynamic ones. The composite materials for the tests are created by combining two or more components with different properties to achieve superior performance to individual components. A crucial aspect of the research is understanding the mechanical behavior of these materials under

different loading conditions. Mechanical tests include tensile tests, compression, bending and bending to evaluate the strength and stiffness of the composite. In plus, impact tests can be performed to determine the material's ability to absorb energy during sudden charging. These tests provide essential data for optimization design and engineering of composite materials.

In the current context, the topic of mechanical research of composite materials with organic compounds remains extremely relevant and constantly evolving. Constant technological advancement and increasing demand for superior performance materials in various industrial and technological fields have generated significant interest and investment in this research area.

Mechanical tests are very important for performance evaluation and the behavior of materials under various types of loads. These tests provide information critical about material properties, such as strength, ductility, hardness, elasticity. These data are essential for engineers and researchers to select materials suitable for specific applications and to develop new materials with improved properties.

2. METHODS

For this paper we made three types of composite panels as follows:

- Plate 1 I made a cement board with dimensions of 25 x 25 x 3.5 cm, using a mix with balanced materials. The composition included cement, sand, water and layers of fiberglass, to ensure the durability and strength of the final product.
- Plate 2 I accurately measured 700 grams of cement and 700 grams of sand, 400 ml of water for the mix and the 4 layers of fiberglass
- Plate 3 For this plate a complex structure is described which is made up of several materials, the board is 25 by 25 cm with a total thickness of 3.8 cm. The central layer of the board is made up of a 3cm thick foam layer, over this layer comes a protection made up of 4 layers of glass fiber, a layer of hemp and finally 4 layers of fiberglass. The end result is an extremely strong and durable cement board with accurate dimensions of 25 x 25 cm, reinforced with layers of glass fiber for increased strength. This method ensures a high quality final product suitable for various structures.

All three plates were tested at bending in three points to find the mechanical proprieties as shown in the figure bellow.

a b c

Figure 1: Plate samples during testing (a- plaster, b- cement, c- hemp-based)

3. Results and conclusions

Following the tests and the results obtained, we generated Force-Displacement graphs for each individual board, as well as a comparative graph for all boards.

Figure 2: Force displacement chart for plasterboard

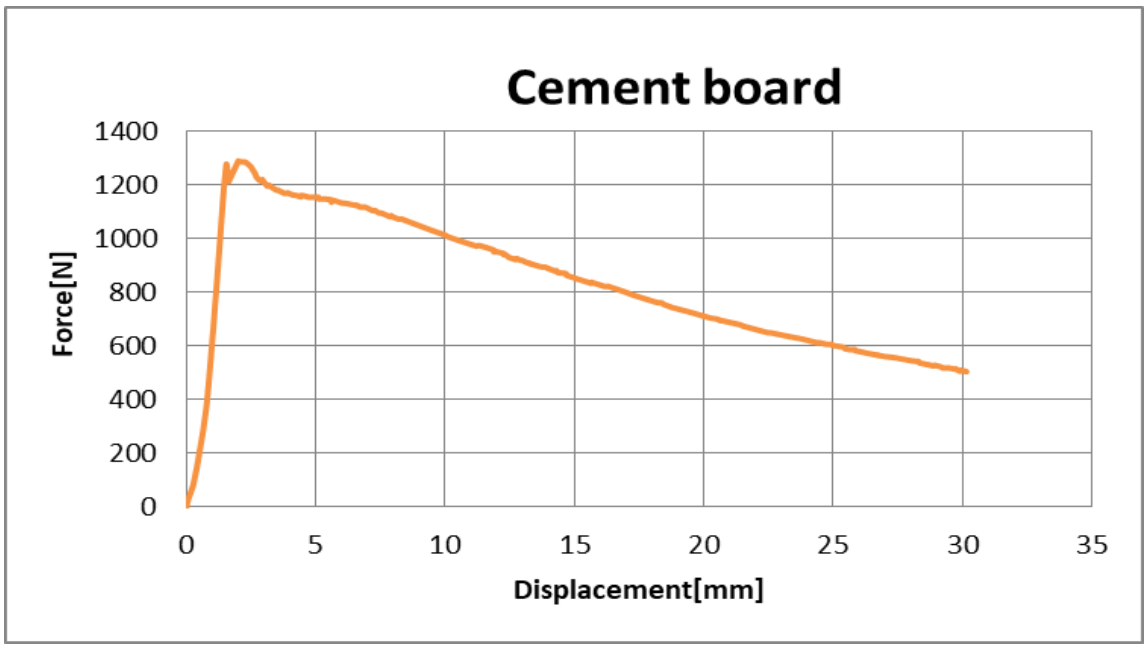

Figure 3: Force displacement chart for cement board

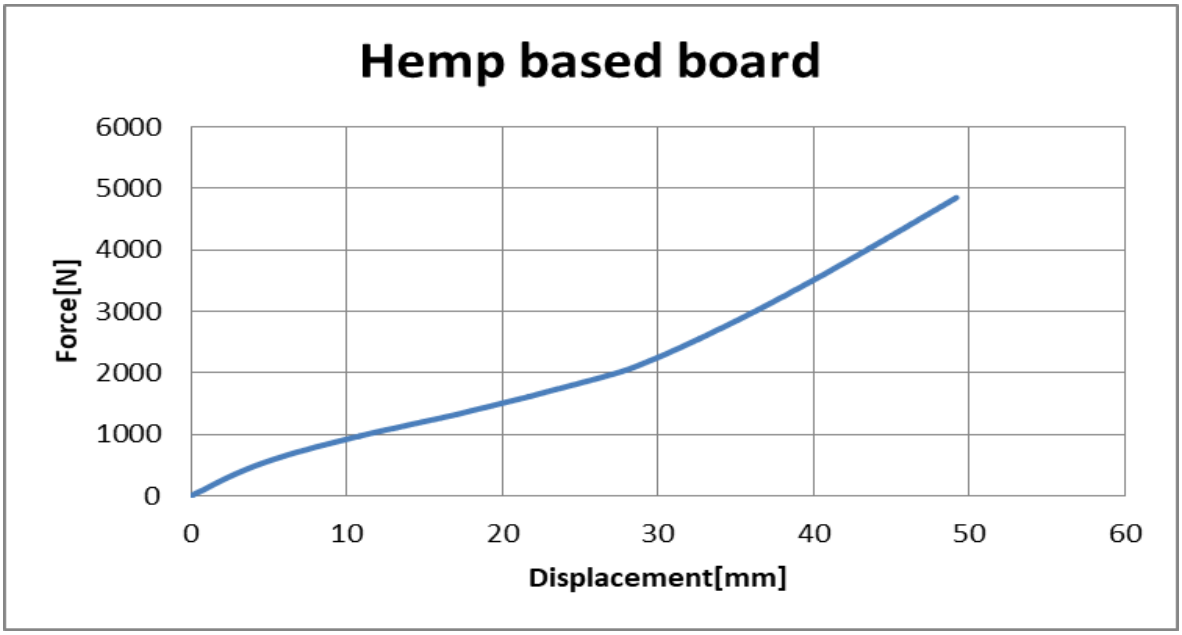

Figure 4: Force displacement chart for hem based board

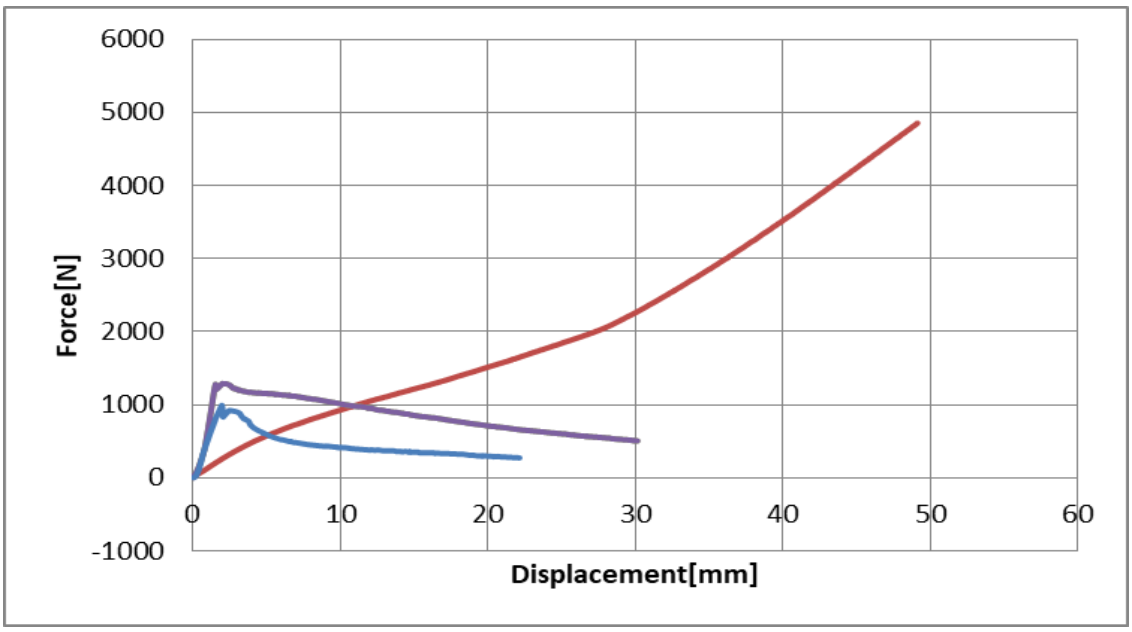

Figure 5: Force-Displacement comparison chart for all samples

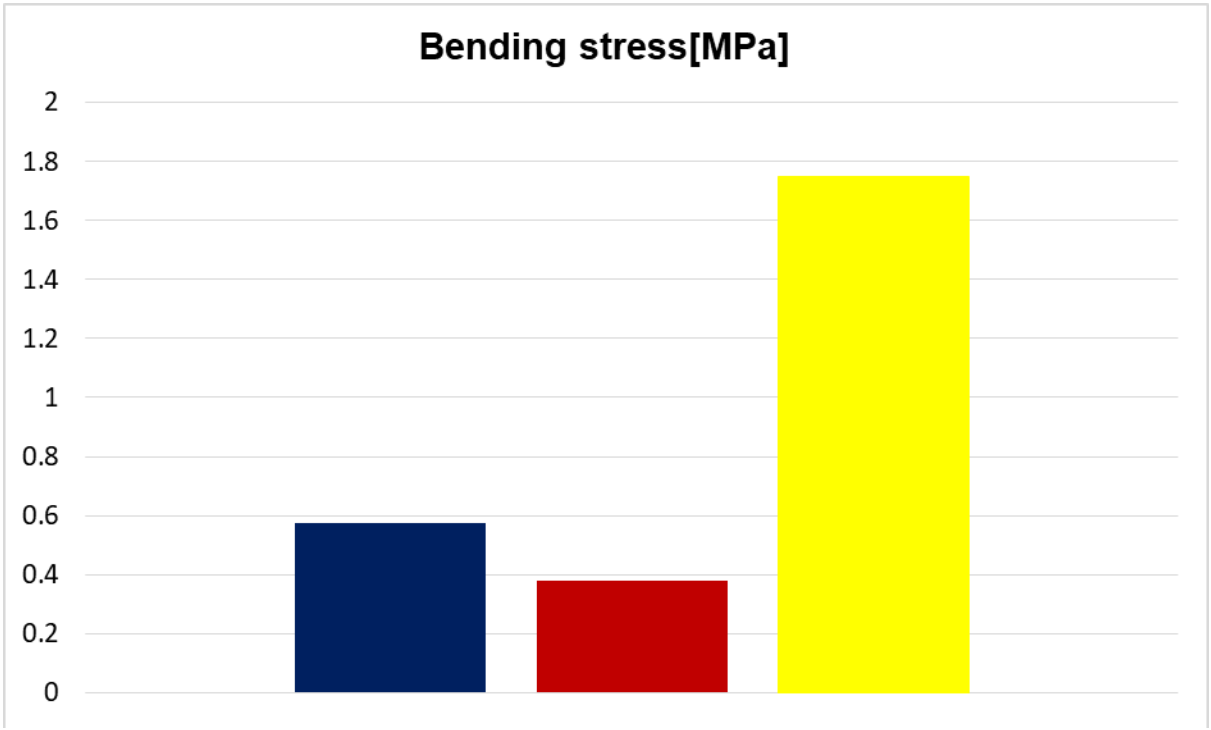

Figure 6: Bending stress resistance comparative chart.(Blue: cement, red: plasterboard, yellow: hemp based)

Table1. Maximum recorded values for all three plates

Plate	Maximum force [N]	Maximum displacement [mm]	Maximum stress [MPa]
Plaster	**991.17**	**22.172**	**0.37759**
Cement	**1289.9**	**30.167**	**0.57331**
Hemp-based	**4853.7**	**49.166**	**1.7491**

The study of mechanical tests of composite materials with organic compounds represents a crucial stage in the development and understanding of the performance of these advanced materials. Following the analysis of the

performed experiments, several significant conclusions can be drawn that contribute to the deepening of our knowledge on the behavior of these complex systems.

First, the results of the mechanical tests highlighted that the addition of organic compounds in composite materials can significantly improve their properties. For example, the tensile strength of these materials was significantly increased compared to composites without organic compounds. This suggests that the interactions between the polymer matrix and the organic compounds led to a homogeneous distribution of charges, thus contributing to the increase in strength.

On the other hand, studies have revealed that mechanical properties can vary depending on the type and concentration of organic compounds used. For example, certain organic compounds can contribute to better adhesion between the phases of composite materials, leading to an increase in shear strength. However, it is important to note that certain high concentrations can have a negative impact on performance, leading to decreased strength or ductility.

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