APPLICATION OF THE SCOURER OR LUFFACYLÍNDRICA UNDER NATURAL, RIGID AND FLEXIBLE RESIN TO OBTAIN A NATURAL COMPOSITE MATERIAL

Daniela Rincón P, Carlos A. Guerrero F, Fabio E. Sierra, Eliana Guerrero-Romero.
Chemistry Department, National University of Colombia, Avenida Carrera 30 Nº 45-02 Edificio Quimica Of. 429 Tel: 3165000 Ext: 14401

ABSTRACT

In a changing world of new ecomaterials, fibers as the scourer or luffa cylindrica appear in new presentations and mixing with other materials to develop better opportunities of use of natural fibers and its importance in the replacement of synthetic fibres. This work presents a research on the use of scourer fiber for composite materials, on the basis of the physical properties that generate conditions of mixing with three binders (matrix) natural: the Rosin, artificial hard: polyurethane resin and artificial flexible: flexible twin resin (epoxy) and finally a polyester resin to make a comparison with other major resins. After the curing, testing of compression and tension to the materials analysed, obtaining three types of composite materials by the above mentioned binders and three proposed presentations of fiber (complete, tissue and ground). The test tube in tension with polyester resin presented a high rigidity and a percentage of deformation of 14 per cent, resulting in less distortion than the woven with resin polyurethane with 12% of deformation.For the results of compression, which presented greater resistance to this was the presentation ground with resin polyurethane with a 2000 kg load absorption as the resin acts as a sponge absorbing the energy of charge and the Union of particles is larger than the other presentationsgenerating greater cohesion among them and avoiding its rupture easily. The presentation that is least resisted was the woven in two resins in the stage of energy absorption of cargo where polyurethane is 800 kg and the flexible twin is 850 kg, because the form of woven fiber distribution creates spaces where there are more resin fiber and this makes that in the absence of fiber responds mechanically with the caracteristics of independent of the fiber resin and makes that you there is less resistance on these points.

***KEYWORDS**: Natural fibers, scourer, industrial design, binder matrix, composite materials, reinforced polymer*

1. INTRODUCTION

The scourer or luffacylindrica has been present in the daily lives of many people, that for its abrasive properties it has been used as a bath sponge. Nowadays with the new materials development, technologies and ecological awareness, natural fibers have had great reception especially by its low-cost and sustainable production.Research has been done for its characterization and mixing with other materials such as natural composite materials that have applications in the field of construction [1], the bioengineering and environmental engineering [2].These natural composite materials are based on natural fibers and synthetic matrices. Today the new investigations include these two natural components, which have been studied several decades ago [3-5].

This work is related to the investigation of the scourer through the mixture with other natural and synthetic agents to improve their characteristics or physical properties and generate new possibilities for use industrially and in product development from industrial design.

2. METHODOLOGY

This work includes the study of scourer or Luffa Cylindrica plant fiber, which analyses characteristics and mechanical and formal properties to then determine its possible applicability in the industrial design.

2.1. Considerations

- Scourer or luffa cylindrica vegetal fiber
- Mechanical and physical properties of the scourer or luffa cylindrica
- Parallel materials in the existing market to the scourer that comply with the same properties and applications.
- Possible contexts and uses of applicability.

2.2. Tools

The research methodology includes the following tools for obtaining information:

- Interviews of experts
- Laboratory tests
- Photographic material
- Comparative analysis

2.3. Phases

The methodology consists of three consecutive key parts which generates various stages of analysis and resolution of the problem. The first is the descriptive phase, the second is the pilot phase and the third is the phase of implementation and results. Table 1 shows the stages of development, the phase's variables and expected results:

Table 1.Phases, considerations and results of the research Project

PHASES	CONSIDERATIONS	RESULTS
Descriptive-state of the art	Bibliographic research and interview experts	Determination of experimental variables
Experimental-Analysis	Laboratory tests	Development of composite natural fiber
Applicability-susceptible contexts	Experts, comparative analysis and tests	To generate applicability of the new material in industrial design and manual instructions for the use of natural, rigid and flexible resin with scourer fiber

The phases are described below:

- ***Descriptive phase:*** This step describes the features and references most important of the scourer vegetable fiber, generating a delimitation

of the problem to treat. It presents specific findings that identify the key concepts:

- Characteristics of the scourer or Luffa Cylíndrica.
- State of the art and existing analysis.

- ***Experimental Phase:*** This phase includes the individual study of the scourer vegetal fiber as their possible mixtures with an agglutinative or structuring material either organic or inorganic. This procedure is given by the independent and dependent variables analysis that cross each other through the experimentation in the laboratory. The dependent variable is the scourer fiber for use and the binder material chosen previously by its high fixation with vegetal fiber as they will always have the same presentation, the opposite of the independent variable is which changes its presentation in this case the different proposed tissues of the scourerfiber for behavior analysis of the mixture with the binders. The analysis of possible mixtures takes into account the mechanical and physical properties both before and after experimentation and then to obtain conclusions and pass to the results and applicability phase.

Key of this phase:

- Processes subject to material characterization for their possible application from industrial design

- ***Results and aplication phase:*** This phase of results and implementation, identify processes and appropriate structural forms of the material for its characterization. These procedures show at this last stage the possible contexts and applications from a generic view of applicability, which will be analyzed and we will take one as example specific, developing its possible process of production and application.

Finally, conclusions arise from the viewpoint of industrial design, for the management of the material and definition of the most appropriate processes for the use of it within an interdisciplinary framework for his result in the design of products.

3. CONCLUSIONS

- The colophony to a crystalline state at the time of the formation of composite material with scourerfiber is able to avoid being broken from its creation by processes more complex as the sintered particles.
- The milled presentation for high cohesion between scourerfibers and polyurethane resin by his characteristic of sponge generate greater resistance to compression soaking up until the time of rupture to 9000 kg.
- Polyester resin having a high resistance to tension with 8.7 MPa of effort and a deformation of 28% respect to other resins where the greatest effort is 2,7MPa of the polyurethane resin (complete presentation). This characteristic of the polyester resin makes a matrix suitable for applications where the effort is in that range.
- The binder plays a very important role in the characterization of the scourerfiber within its forming as a composite material that gives the greatest resistance to tension and compression tests as in this case the used resins act with its own characteristics on the one hand elastic on the other handrigid and makes the presentations as the milled and the tissue to generate larger responses of mechanical resistance to the other presentation: the complete or natural state of the fiber.
- The milled presentation in the two tests, tension as compression behaves with high resistance to deformation. On the one hand with polyurethane resin resists more as generates more cohesion because the particles are held together and therefore the fiber is multi-directional and so resists more in every ways either tension or compression.

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