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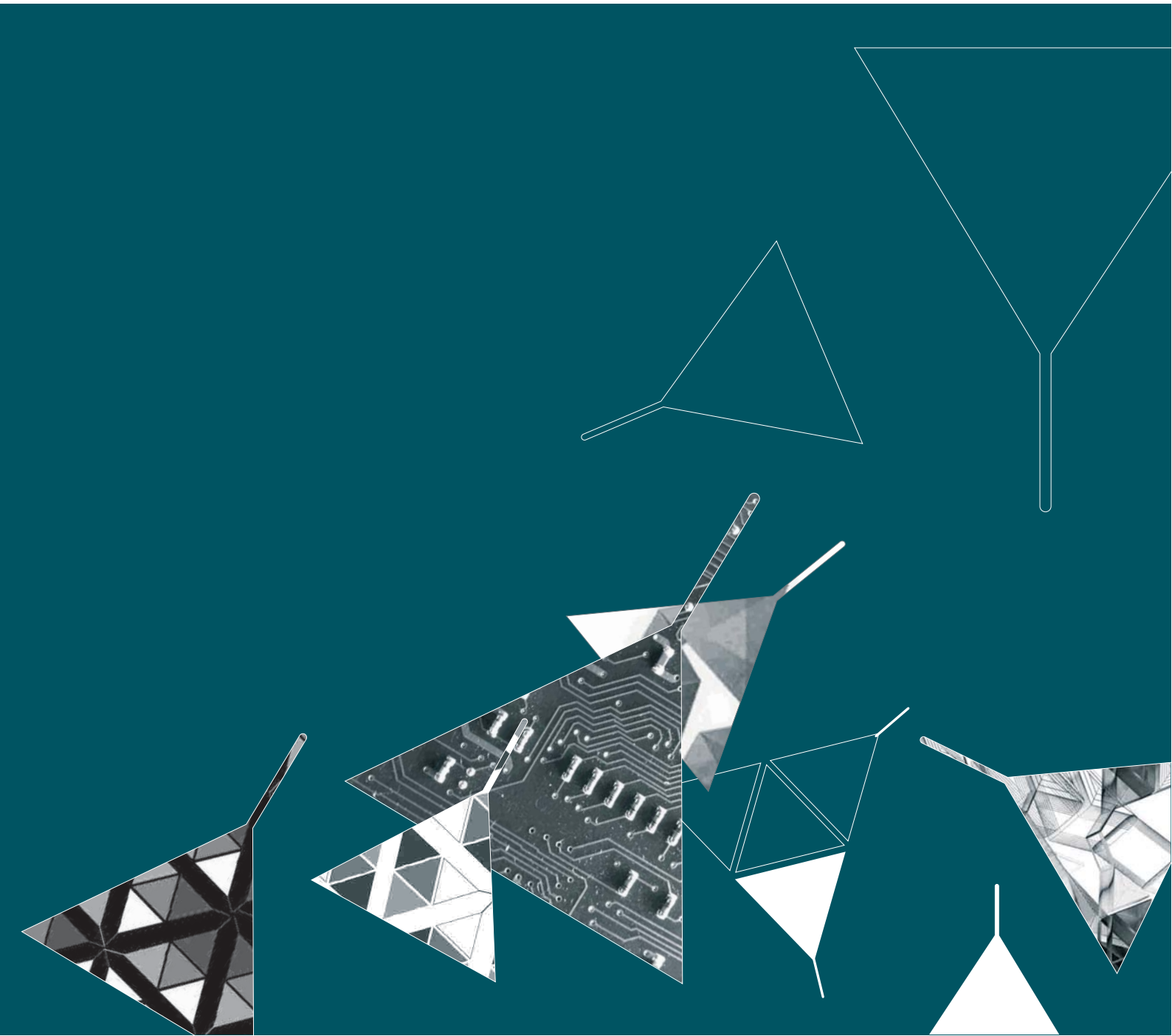

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PRODUCTION OF COMPOSITE THERMOSETTING RESIN REINFORCED WITH FIBRES FROM AUTOCHTHONOUS PLANT, THIS CASE THORN FROM HEDGEHOG OF CHESTNUT

João Rocha [1], Luís Queijo[1]

[1] Mechanical Technology Department, Polytechnic Institute of Bragança, jrocha@ipb.pt

KEYWORDS: Innovation, Design, Chestnut, Thermosetting resin.

ABSTRACT: *In Portugal northeast, one of most valuable forest products for human consumption are chestnuts. The chestnut hedgehog is left on the ground where it will be incorporated into the soil over time. This way, one form to add some value to chestnut industry is trying to profit from chestnut wastes. The use of natural fibers as reinforcement in polymer matrix composites is gaining popularity in the development of renewable products (Rocha e Queijo 2013). Due to their unusual appearance and translucency to light, composites with thorns from chestnut hedgehog may have not negligible commercial value.*

INTRODUCTION

In the last years of the 20th century, especially in the sixties and seventies the synthetic products have almost completely replaced the natural materials in industrial applications (Schuh 2000).

In the 90's decade, the theme environment came to the public and politic agenda, and start de conscience to protect the planet. Reduce, Reutilize and Recycle became part of the common vocabulary.

The use of plant fibres for reinforcement in polymeric materials plays an import role in several industries. Also, it's possible the use of plant fibres for reinforcement and decoration in polymeric sheet plates. These plates can be used in "design" objects, like furniture.

LITERATURE REVIEW

Advantages of natural fibres over man-made glass fibre are: low cost, low density, competitive specific mechanical properties, reduced energy consumption, carbon dioxide capture, and biodegradability. Natural fibres offer a possibility to developing countries of using their own natural resources in their composite processing industries (Drzal, Mohanty e Misra 2001).

In fibre-reinforced composites, the fibres serve as reinforcements by giving strength and stiffness to the composite structure (Drzal, Mohanty e Misra 2001).

Among all the matrix polymers, polypropylene (PP) has attained much commercial success in bio-composites for automotive applications. Although unsaturated polyester resin can be used in bio-composite applications commercially, the non-recyclable nature of this thermoset resin over thermoplastic recyclable PP is hindering its growing importance (Drzal, Mohanty e Misra 2001).

Eco-friendly bio-composites from plant derived fiber and crop-derived plastics would be the novel materials of the 21st century not only as a solution to the growing environmental threat but also as a solution to alleviating the uncertainty of the petroleum

supply which is expected to decline between 2010 to 2020 (Drzal, Mohanty e Misra 2001).

After decades of high-tech developments of artificial fibers like aramid, carbon and glass it is remarkable that natural fibers have gained a renewed interest, especially as a glass fiber substitute in automotive industries (Drzal, Mohanty e Misra 2001).

METHODOLOGY

For this study we used chestnut hedgehogs from the north-eastern region of Portugal that were crushed with the help of batter bread. The spikes were separated from other fibres. These were dried after cleaning and used in the production of composite plates.

Fig. 1 - Chestnut hedgehogs (top-left); Chestnut hedgehog spikes (top-right); thermosetting resin plate and chestnut hedgehog spikes - plate photographed backlit (bottom-left); plate photographed with front light (bottom-right).

For the production of the plate was used thermosetting polyester resin with 3% catalyst. After thorough mixing with thorns, was placed in a mould with the desired dimensions, previously coated with mould release agent. We used a 2-ton hydraulic press for the compression plate.

FINDINGS/RESULTS

Samples from the plate produced obtained median mechanical characteristics. Only three specimens were tested form this single plate.
In this uniaxial tensile test was obtained 42 MPa.

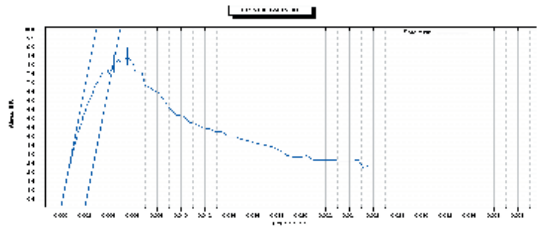


Fig. 2 Thermosetting resin plate and chestnut hedgehog spikes. Plate photographed with front light.

Fig. 3 Thermosetting resin plate and chestnut hedgehog spikes. Plate photographed with front light.

This product present an innovative aspect that can be can be used in daily articles. The fact that this product has translucent aspect favours some specific applications.

CONCLUSIONS

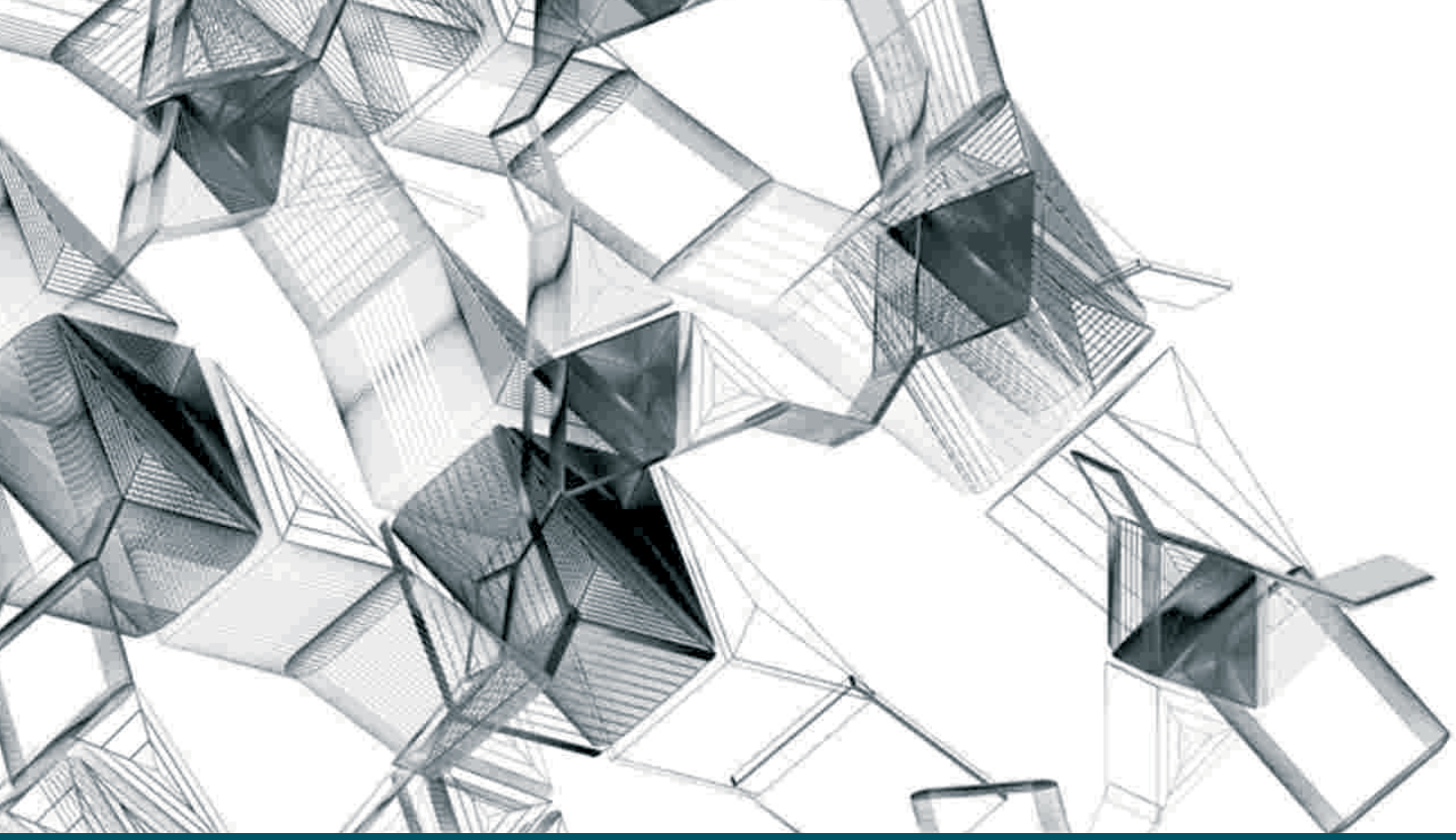
As a first test, it appears that the use of this type of composite is promising due to the natural and unusual aspect. The mechanical characteristics are not very high, but appear to be high enough for applications such as furniture or other decoration applications. For applications with higher mechanical demands, it should be studied composites that may incorporate glass fibres.
Using this natural fibre this product become a more ecological substitute and environment friendly than the traditional polymeric glass fibre composites

REFERENCES

Drzal, Lawrence T., A. K. Mohanty, and M. Misra. "Bio-Composite Material as Alternatives to Petroleum- Base Composites for Automotive Applications." *Automotive Compósites Conference*. Troy, 2001.

Rocha, Joao, and Luis Queijo. "Mechanical Caracterisation of Polyester and Sunflower Natural Fiber Composito." *17 International Conference on Composite Structures*. (acepted) Porto, 2013.

Schuh, Thomas G. "Renewable Materials for Automotive Applications." Daimler-Chrysler AG, Stuttgart, 2000.



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