

Book of abstracts of the
**1st International Conference
on Materials Design
and Applications 2016**

30 June | 1 July, 2016

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Factors Optimization to Improve the Tensile and Flexural Properties of Short Fibre Non-woven Hedgehog Chestnuts Spines Reinforced Polyester Composites

J.E. Ribeiro^{1,2}, J. Rocha¹, L. Queijo¹

¹ Polytechnic Institute of Bragança, ESTIG, C. Sta. Apolónia, 5301-857 Bragança, PT.

² LAETA-INEGI, FEUP Campus, Dr. Roberto Frias Street, 400, 4200-465 Porto, PT.

Over the last decade has been observed an increased interest in the use of natural fibers instead of synthetic fibres (i.e. glass, carbon or kevlar fibres). The natural fibre composites (NFC) have important advantages like their fibers are a renewable resource, for which production requires little energy, involves CO₂ absorption, whilst returning oxygen to the environment and can be produced at lower cost than synthetic fibre [1]. However, the NFC have also some limitations, namely, lower durability than for synthetic fibre composites and they have a greater variability of properties [1]. Nevertheless, all these characteristics can vary profoundly depending on many factors such as fibre selection, matrix selection, interfacial strength, fibre dispersion, fibre orientation, composite manufacturing process and porosity [2]. In this work, the authors propose study the influence of some factors in the short fibre non-woven hedgehog chestnuts spines reinforced polyester composites performance. For this propose, will be used the design of experiments (DOE) approach developed by Taguchi. Thus, the factors that will be controlled are the fibre dispersion which is defined by fibre/matrix mass ratio or weight fraction, the interfacial strength that could be improved using an alkali-silane treatment and, finally, the level of moisture in the fibres. For a preliminary analysis a suitable number of levels for each factor is three. Considering the number of factors to be controlled and the number of levels, an adequate orthogonal array of experiments is the L₉ and the data that is analyzed is the tensile and flexural properties. To finish, the data will be statistically treated using the analysis of variance and determined the influence of each factor in the composite performance as well as the optimal factors and levels combination to obtain highest values of tensile and flexural strength.

[1] B-H. Lee, H-J. Kim and W-R. Yu, *J. Fib. and Poly.*, 10(1), 83 (2009).

[2] K.L. Pickering, M.G. Efendy and T.M. Le, *J. Comp. Part A*, 83, 98 (2015).