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## **NANOREINFORCED MULTILAYERED COATINGS**

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The present work consists on the manufacture and characterization of a multilayered coatings, where each layer is constituted by a thermosetting resin doped with different nanofillers. The main goal is the development of different properties and functionalities in the multilayered coating depending on the nature of the nanofiller added.

Particularly, we have optimised the manufacturing process of a layer formed by epoxy matrix doped with graphitic nanofillers: carbon nanotubes, graphene nanoplatelets or both. These isolated coatings present several advantages, such as high hardness and wear properties, good thermal properties and high electrical conductivity.

A second outer layer has been optimised in a multilayered coating, based on the same epoxy matrix doped with ceramic nanofillers, such as boron nitride nanoplatelets. These nanoparticles induce high hardness and good thermal properties, being electrically insulating.

Both epoxy layers of the coating present high adherence on composite materials of epoxy matrix reinforced with glass fibers. Their use enhances the aging properties, decreasing their water absorption due to the barrier properties of the nanoparticles; increases the hydrophobicity of the surface, inducing the self-cleaning functionality; and enhances the wear properties of the composites; in addition to the new functionalities induced by the electrical conductivity of the graphitic doped layer, such as self-heating by Joule's effect, useful as anti-icing and de-icing coating.

[1] J. Guo, P. Saha, J. Liang, M. Saha, B. P Grady. Multi-walled carbon nanotubes coated by multi-layer silica for improving thermal conductivity of polymer composites. *Journal of Thermal Analysis and Calorimetry* 113, 467-474 (2013)

[2] P. Nguyen-Tri, T. A. Nguyen, P. Carriere, C. N. Xuan. Nanocomposite Coatings: Preparation, Characterization, Properties, and Applications. *International Journal of Corrosion* ID 4749501 (2018).