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Delamination resistances improvement of carbon fiber composites with tailored graphene oxide

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This contribution analyzes the influence of functional groups on the surface of graphene oxide surface chemistry on its ability to reinforce an epoxy-carbon fiber system. We have reported a simple method to remove most of the oxidative debris from the as produced graphene oxide (aGO) sample, through an alkaline post-treatment, which yields sheets of higher size and lower oxygen content than parent graphene oxide, hence high size and partially reduced GO (prGO). Both GO and prGO fillers were incorporated in an epoxy matrix, and the mechanical properties of the nanocomposites and vaccumm infused carbon fiber laminates were studied. Nanocomposite results indicated that prGO offered better increases in flexural stiffness and flexural strength than aGO, but same results in mode I fracture toughness. On the other hand, prGO performed considerably better in both tensile and mode-I interlaminar fracture toughness. The fracture energy required for the onset of mode I interlaminar delamination was enhanced by 31% and 60% by adding 0.2wt.% of aGO and prGO, respectively, covering positively the entire range of crack growth. The effect of adding graphene oxide of larger average sheet size and lower oxygen surface chemistry, i.e. with partial elimination of the oxidative debris, allows a direct chemical bonding when curing step between oxygen complexes of clean and large sheets and the resin, improving the reinforcement efficiency.

Biography

Ignacio Martin-Gullon received his PhD in Chemical Engineering from the University of Alicante in 1995, involved with adsorbent carbons. He worked thereafter as a Research Postdoc Associate in the University of Kentucky in the carbon fiber topic. In 1998, he moved to industry position as a R&D product development engineer in NORIT NV (now Cabot Corp), in Amersfoort (Netherlands). Finally, he came back to the University Alicante as a Professor in the Chemical Engineering Department. He has written over 70 scientific papers in high-impact journals, in nanotechnology, material science, environmental and energy engineering. He was de advisor of 8 PhD students. He did a recent sabbatical period in the Pennsylvania State University. He is project evaluator in different programs, related to material science and technology. Very recently, he co-founded the spin-off company Applynano Solutions, to develop customized solutions to specialized SME based on nanomaterials on polymers.

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