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XPS ANALYSIS OF THE CARBON FIBERS SURFACE MODIFIED VIA HMDSO TO CARBON NANOTUBE GROWTH

Cardoso, L.D.R.(1); Gomes, M.C.B.(1); Trava-airoldi, V.J.(1); Corat, E.J.(1); Lugo, D.C.(2);
Instituto Nacional de Pesquisas Espaciais(1); Instituto Nacional de Pesquisas Espaciais(2); Instituto Nacional de Pesquisas Espaciais(3); Instituto Nacional de Pesquisas Espaciais(4); Instituto Nacional de Pesquisas Espaciais(5);

Carbon fibers (CF) have been widely used to reinforce structural composites. Due to their strength-to-weight properties, CF composites are finding increased structural uses in areas such as aerospace, aeronautical, automobile and others. The strength of the fiber-resin interface bond has been found to be the limiting factor to the mechanical properties of CF-epoxy materials, due to their non-polar nature that limit the affinity of CF to bind chemically to any matrix. The growth of carbon nanotubes (CNTs) on the surface of CF is a promising approach for improving mechanical, electrical and thermal properties of structural composites. However growing CNTs on CF presents some obstacles, such as diffusion of metal catalyst particles on CF, uneven CNT growth and loss of mechanical properties of CF. To avoid the diffusion of catalyst particles we modified the CF surface with hexamethyldisiloxane (HMDSO) at low temperature (400 °C), also preventing the loss of mechanical properties and allowing uniform CNTs growth. We deposited CNTs via floating catalyst method, with ferrocene providing the catalyst particle and the oxidative dehydrogenation reaction of acetylene providing the carbon. The CF surface modification was analyzed via X-ray photoelectron spectroscopy (XPS) and CNTs growth via scanning electron microscopy with field emission gun. The XPS analysis showed that HMDSO promotes the binding of oxygen to carbon and silicon present on CF surface, the chemical modification of the surface of the CF enables the uniform growth of carbon nanotubes.