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Application of positron annihilation lifetime spectroscopy to study mechanical properties of epoxy-matrix nanocomposite containing nano cobalt oxide/graphene oxide hybrid

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Abstract

In this research, Epoxy-matrix nanocomposite containing nano Cobalt Oxide(Co_3O_4)/ Graphene Oxide hybrid (0.0, 0.05, 0.1 and 0.3 wt%) were prepared. The successful deposition of Co_3O_4 nanoparticles on the surface of the Graphene Oxide, using the solution synthesis method, was confirmed by SEM, EDX and XRD tests. Tensile strength and positron annihilation lifetime spectroscopy tests were performed on the samples, and then the relationship between the results of these two types of tests was studied. The results of the tensile strength test showed that the sample containing 0.05% by weight of nano cobalt oxide/graphene oxide had the highest tensile strength (46.9 MPa). Similarly, the results of positron annihilation lifetime spectroscopy showed that the lowest free volume hole size in the samples was related to the sample containing 0.05% by weight of nano cobalt/graphene oxide hybrid. In general, the results of this research showed that there is a direct relationship between the decrease in the free volume hole size and the increase in the tensile strength of the samples.

Keywords: nanocomposite, CobaltOxide/GrapheneOxide hybrid, Tensile strength, PALS

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