World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:19, No:01, 2025

# Wear Resistance of Graphene Oxide and Carbon Nanotubes Silanized Coatings

**Authors :** Henrique Gomes dos Santosa, Manoel Henrique Alvesa, Jane Zoppas Ferreiraa, Annelise Kopp Alvesa

**Abstract :** This work aimed to seek an environmentally sustainable surface coating alternative by researching the influence of the addition of graphene oxide (GO) and carbon nanotubes (CNT) on the silanization of coatings to increase the wear resistance in galvanized steel, using the pin-on-disk test. The results obtained were compared between different concentrations of additives and the number of coating layers, in addition to comparing with samples without coating and only with silane layers. Bis-1,2-(triethoxysilyl)ethane (BTSE) silane was used in silanizing the coatings with CNT or GO and applied to the samples through dip-coating to form one, four, or eight layers. The wear test results found that three samples stood out in relation to the objective, showing an increase in wear resistance compared to the galvanized sample only. The rolling effect and the lubricity character presented by carbon nanotubes were positive for the increase in wear resistance obtained. The reduction in wear compared to the galvanized-only sample reached 82%. Raman spectroscopy was also carried out to detect the presence of silane, GO, and CNT, in addition to roughness tests and SEM to assess the homogeneity of the coating. The carbonaceous additives, graphene oxide, and carbon nanotubes in certain amounts of layers and specific concentrations fulfilled their objective against the wear imposed on the substrate.

**Keywords :** silane, coating, graphene oxide, carbon nanotubes, wear resistance
**Conference Title :** ICMSE 2025 : International Conference on Materials Science and Engineering
**Conference Location :** Montevideo, Uruguay
**Conference Dates :** January 16-17, 2025