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Preparation, Properties, and Microbial Impact of Tungsten (VI) Oxide and Zinc (II) Oxide Nanoparticles Enriched Polyethylene Sebacate Nanocomposites

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Abstract - Nanoparticles of tungsten oxide (WO_3) and zinc oxide (ZnO) enriched polyethylene sebacate (PES) nanocomposites were prepared through the co-precipitation process and condensation polymerization reaction. The obtained nano-sized particles of WO_3 and ZnO, PES, and nanocomposites (WO_3-PES NC and ZnO-PES NC) were investigated. The average molecular weight determinations of the cured PES were measured using the gel permeation chromatography (GPC) technique. Fourier-transform infrared spectroscopy (FTIR) and X-ray diffraction (XRD) spectra assured the formation of the polymeric nanocomposites.$WO_3$and ZnO nanoparticles supposed a condensed porous shape and found implanted in the polymer matrix, as detected by scanning electron microscopy (SEM) and transmission electron microscopy (TEM) methods. These nano-scale systems achieved an electrical conductivity value by embedded the conductive nano-oxides into the lattice as a result of the ion-ion interaction effect. The microbial influence of the nanocomposites was examined against pathogenic bacteria; Pseudomonas aeruginosa, Escherichia Coli, Staphylococcus Aureus, and Bacillus subtilis, and Fungi; Aspergillus niger, and Candidaalbicans. Results exhibited that these nanocomposites have antimicrobial effects from a moderate to slight high on bacteria and high on fungi which was confirmed by a clear zone of inhibition. This study contributes *to the design of eco-amiable composites for implementation in photocatalytic coatings.*

Keywords: Metal oxide; microbial activity; nanocomposites; nanotechnology; polyester.