THE EFFECT OF THERMO-OXIDATIVE DEGRADATION ON ULTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE (UHMWPE)

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ABSTRACT

THE EFFECT OF THERMO-OXIDATIVE DEGRADATION ON ULTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE (UHMWPE)

This work examines the effects of thermo-oxidative degradation on Ultra-High Molecular Weight Polyethylene (UHMWPE). Because of its remarkable qualities—such as its excellent tensile strength and chemical resistance—UHMWPE is frequently employed in industries. Nevertheless, its performance and longevity are impacted by thermo-oxidative deterioration. The goal of this research is to evaluate how UHMWPE degrades at various temperatures, as well as to determine the effect on its chemical composition and surface morphology. To assess the level of oxidation and morphological alterations, digital optical microscopy, and Fourier Transform Infrared Spectroscopy (FTIR) were used. The findings of this study exhibited that a temperature rise has increased the degree of oxidation in terms of the carbonyl index (CI) and oxidation index (OI). The average values of OI and CI are 1.0257 and 1.0334 respectively. Furthermore, increased temperature also changed the morphology of UHMWPE in terms of roughness, brittleness, and discoloration. Hence, it is observed that varying temperatures during thermo-oxidative degradation do affect UHMWPE materials, especially on their chemical and mechanical properties which greatly affect their stability and performance.