Graphene Oxide-Enhanced Ultra-High Molecular Weight Polyethylene Oxide and Tannic Acid Innovative Nanocomposites

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This study investigates the synthesis and characterization of innovative polymer nanocomposites, specifically focusing on ultra-high molecular weight polyethylene oxide (UHMW PEO) and tannic acid (TA) reinforced with graphene oxide (GO). The incorporation of GO and TA into UHMW PEO matrices aims to enhance the mechanical properties and functionality of the resulting nanocomposites. Through a series of experiments, different processing conditions, including various mixing and drying methods, were explored to optimize the dispersion and interaction of the nanomaterials within the polymer matrix. The results reveal that the addition of GO and TA significantly improves the mechanical strength average elastic modulus increased by almost 250%, yield strength increased by almost 183%, ultimate tensile strength increase by 154% without reducing elongation and stability of the composites, particularly under specific processing conditions. However, challenges such as precipitation, agglomeration, and dispersion issues at higher additive loadings were encountered, adversely affecting the mechanical properties. This research provides valuable insights into the intricate interplay between processing parameters, nanomaterial content, TA content, and the unique characteristics of UHMW PEO. The findings lay a foundation for further research to optimize these materials for a wide range of potential applications, contributing to the advancement of polymer nanocomposite technology.

References

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Figures



Figure 1: Chemical structure of **a)** Polyethylene oxide, **b)** Graphene, GO, rGO, & **c)** Tannic acid (https://doi.org/10.3390/ijms23010033, https://www.shutterstock.com, https://byjus.com/chemistry/tannic-acid)