

**THE EFFECT OF CARBON BLACK IN ENHANCING TENSILE
PROPERTIES OF ULTRA HIGH MOLECULAR WEIGHT
POLYETHYLENE**

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ABSTRACT

THE EFFECT OF CARBON BLACK IN ENHANCING TENSILE PROPERTIES OF ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE

This study aims to assess the impact of carbon black (CB) as a filler on the stiffness and mechanical strength of ultra-high molecular weight polyethylene (UHMWPE) which is a widely applied polymer with limitations with processing and resistance to creep. Solid-state compression molding was used to prepare composites of varying CB loading (1, 5, and 10 php) which were then subjected to analysis for tensile strength, morphology, and chemical composition. FTIR analysis showed that CB was successfully incorporated and the tensile tests showed a reduction in strength when CB loading was added with UHMWPE. Morphology studies indicated that increasing filler CB loading increased the distribution of the filler but also showed some agglomeration problems at higher loadings. These results show that when CB is evenly dispersed within UHMWPE, it enhances the polymer's stiffness and properties. This study showed the opposite trend from other studies whereby CB is a low-cost filler in improving the performance of UHMWPE for industrial and biomedical applications. More optimization of the mixing method and actual testing could increase the quality and reliability of the material.

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LIST OF ABBREVIATIONS

| | |
|----------|---|
| UHMWPE | Ultra-high molecular weight polyethylene |
| CB | Carbon Black |
| PE | Polyethylene |
| HDPE | High Density Polyethylene |
| LDPE | Low Density Polyethylene |
| LLDPE | Linear Low-Density Polyethylene |
| UV | Ultraviolet |
| PPE | Personal Protective Equipment |
| FTIR | Fourier Transform Infrared Spectroscopy |
| ASTM | The American Society for Testing and Materials |
| ATR-FTIR | Attenuated total reflectance - Fourier Transform Infrared |