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

AHMAD FIRDAUS BIN SUHAIMI

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Assoc. Prof. Dr. Razif Muhammed Nordin
Supervisor
B. Sc. (Hons.) Chemistry With Management
Faculty of Applied Science
Universiti Teknologi MARA (UiTM)
02600 Arau
Perlis

_____

Ts. Muhammad Salihin Zakaria
Co-supervisor
Faculty of Chemical Engineering and Technology
Universiti Malaysia Perlis (UniMAP)
02600 Arau
Perlis

_____

Dr Siti Nurlia Ali
Project Coordinator
B. Sc. (Hons.) Chemistry With Management
Faculty of Applied Science
Universiti Teknologi MARA (UiTM)
02600 Arau
Perlis

_____

Dr Nur Nasulhah Kasim
Head Center of Studies
Faculty of Applied Science
Universiti Teknologi MARA (UiTM)
02600 Arau
Perlis

Date :_____

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