THE FUNCTION OF CALCIUM CARBONATE IN ENHANCING STIFFNESS OF ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE

MUHAMMAD IZZAT BIN AHAMAD HASIM

Final Year Project Report Submitted In
Partial Fulfilment of The of The Requirement for The
Degree Of Bachelor of Science (Hons.) Chemistry With Management
In The Faculty of Applied Science
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This Final Year Project Report entitled **"The Function Of Calcium Carbonate in Enhancing Stiffness of Ultra High Molecular Weight Polyethylene"** was submitted by Muhammad Izzat Bin Ahamad Hasim in partial fulfillment of the requirements for the Degree of Bachelor of Science (Hons.) Chemistry With Management, in the Faculty of Applied Sciences, and was approved by

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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 FUNCTION OF CALCIUM CARBONATE IN ENHANCING STIFFNESS OF ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE

The aim of this study is to assess the impact of Calcium carbonate ($CaCO_3$) 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 creeping. Solid-state compression molding was used to prepare composites of varying $CaCO_3$ concentration (5, 10, and 20 php) which were then subjected to analysis for tensile strength, morphology, and chemical composition. FTIR analysis showed that $CaCO_3$ was successfully incorporated, and the tensile tests showed a reduction in strength at lower filler concentrations which improved at higher loading. Morphology studies indicated that increasing filler $CaCO_3$ concentration increased the distribution of the filler but also showed some problems of agglomeration at lower $CaCO_3$ concentrations. These results show that when $CaCO_3$ is evenly dispersed within UHMWPE, it does enhance the stiffness and properties of the polymer. This study shows the potential of $CaCO_3$ as a low-cost filler in improving the performance of UHMWPE for industrial and biomedical applications. More optimization on the mixing method and actual testing will increase the quality and reliability of the material.

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