UNIVERSITI TEKNOLOGI MARA

EXPERIMENTAL-NUMERICAL ANALYSIS OF KAOLIN-SILICONE BIOCOMPOSITES

AHMAD FARIDZAL BIN ROSLI

MSc

February 2021

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Postgraduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Ahmad Faridzal bin Rosli
Student I.D. No.	:	2019640952
Programme	:	Master of Science (Mechanical Engineering) – EM703
Faculty	:	Mechanical Engineering
Dissertation Title	:	Experimental-Numerical Analysis of Kaolin-Silicone Biocomposites
Signature of Student	:	.....
Date	:	February 2021

ABSTRACT

Kaolin is one of the widely uses clay in many applications such as cosmetics, pottery and ceramic, adhesives and tiles. Furthermore, kaolin is also being used as a filler for several applications for example filler for paper coatings, paint and cosmetics, because of its inertness to skin, low viscosity and good dispersion. However, there is no venture on combining kaolin into silicone rubber without curing agent. Therefore, this study aims on how to reinforce kaolin into silicone rubber without uses of hardener or curing agent. Likewise, the properties of this new biocomposites is yet to be quantified experimentally and mathematically. This problem led to the implementation of hyperelastic constitutive models. The specimens were tested using uniaxial tensile test and uniaxial compressive test using ASTM D412 and ASTM D575 as standard, respectively. The data from both experiment tests were analysed numerically using application of Neo-Hookean model and Mooney-Rivlin model as a few of several hyperelastic constitutive models. Excel Solver was executed to determine the material constant and the stress-stretch curve was fitted to mimic the experimental data curve. The result of numeral analysis showed that Mooney-Rivlin produce the best curve fit for both tensile and compressive behaviour, as it imitates the best to the experiment data curve. 4wt% of Kaolin-Silicone biocomposites exhibited the best tensile properties and 12wt% of biocomposites showed the best compressive properties. This study concluded that Kaolin-Silicone biocomposites is able to be produced without aids of hardener or curing agent, and it exhibited a non-linear behaviour as hyperelastic models especially Mooney-Rivlin is capable to quantify the mechanical properties of the biocomposites.

ACKNOWLEDGEMENT

In the name of Allah, the Most Beneficent, the Most Merciful. I would like to firstly thank Allah for this precious opportunity to have completed my MSc successfully.

My gratitude and thanks go to my supervisor Prof Ir Dr. Jamaluddin Mahmud for the non-stop guidance, supports, advices and critiques that help me to complete my MSc dissertation and shape me to become who am I today. Not forgetting my co-supervisor, Ts. Dr. Nor Fazli Adull Manan and Mr. Mustakim Omar (Alcon Johor Sdn. Bhd.), whose assist we knowledge and support during MSc period.

My appreciation goes to Dr. Hafiz bin Mohd Noh, the coordinator for MSc programme and laboratory technicians of faculty of Mechanical Engineering who provided the facilities and assistance during sampling. Special thanks to my colleagues and friends for helping me with this project.

Finally, this dissertation is dedicated to my very dear father, Rosli bin Abdullah and mother, Nor Aishah binti Mohd Nizar for their vision and determination to educate, support and guide me. They support me to rise when I am at my worst. This piece of victory is dedicated to both of you. Also, a very huge appreciation to my siblings who gave me their moral support in order to help me finish my dissertation. Alhamdulillah.

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