

UNIVERSITI TEKNOLOGI MARA

**EFFECTS OF WASHING CYCLES
ON MORPHOLOGICAL
STRUCTURES, YARN LINEAR
DENSITY AND ULTRA-VIOLET (UV)
RESISTANCE OF ZINC OXIDE (ZnO)
COATED COTTON YARN**

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MSc

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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 dissertation 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 Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Cotton is one of the important cellulosic natural fibres that is widely used due to its unique characteristics, such as hygroscopic fibre properties, comfort, tensile properties, and bio-degradation. However, cotton without any modification could not give a better performance in properties, such as ultraviolet (UV) resistance. Therefore, this study has incorporated zinc oxide (ZnO) onto cotton yarn. To improve the adherence of ZnO particles onto the yarn, a 1,2,3,4-Butanetetracarboxylic acid (BTCA) was used as a crosslinker. After the crosslinking process, the cotton yarn was coated at different ZnO concentrations, which were 0.25% and 0.5%, respectively using the ultrasonic dip-coating method. The ZnO coated cotton yarn was then washed with several washing cycles to investigate the changes of the morphological structures, yarn linear density, and UV resistance of the yarn. The scanning electron microscopy (SEM) results showed a significant difference in the morphological structure between uncoated cotton yarn and ZnO coated cotton yarn. The energy disperse X-ray (EDX) results showed that 0.25% ZnO coated cotton yarn performed a better washing durability compared to the concentration of 0.5%. Even after several washing, zinc (Zn) from the 0.25% ZnO coated yarn only reduced to 23%, while Zn from the 0.5% ZnO coated yarn reduced to 86%. The transmittance percentage of 0.25% ZnO coated cotton yarn for UVA decreased from 14.94% to 14.21%, from unwashed to 20th washing cycles. A decrement of the transmittance percentage was also found for UVB, where the value decreased from 7.40% to 7.02 %, from unwashed to 20th washing cycles. The same trend was observed on 0.5% ZnO coated cotton yarn. The results show that the ZnO coated cotton yarn can still provide a good UV protection property even after washing.

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