

## Mechanical and thermal properties of calcium carbonate filled kenaf reinforced unsaturated polyester/epoxidized palm oil composite

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### ABSTRACT

Commercialized unsaturated polyester (UPE) resin which being used as a matrix system in composite materials is petroleum based and not environment friendly. Towards the sustainable green technology era, an advanced green composite materials have widely being studied using natural and renewable source materials such as vegetable oil and natural fibre. In line with the stated issues and needs, this study presents the development of advanced green composites made from a mix of non-renewable based UPE, renewable based epoxidized palm oil (EPO) and natural calcium carbonate ( $\text{CaCO}_3$ ) filler onto Kenaf (*Hibiscus cannabinus*) mat. Palm oil based unsaturated resin is the latest advanced green composite that has been explored by researchers nowadays. According to the previous study, the addition of palm oil decreased the tensile modulus and strength of UPE resin. Thus, this study was conducted to explore the potential of adding  $\text{CaCO}_3$  as filler to enhance the modulus and strength properties of the UPE/EPO blend resin. In this study, UPE were firstly mixed with EPO at a ratio of 80/20 with addition of  $\text{CaCO}_3$  at different loadings (3 phr, 5 phr, 7 phr and 9 phr) and benzoyl peroxide initiator (1.5 phr). The resin was then hand layed-up onto the kenaf mat, further undergo hot pressed and curing process. The composite was characterized using Fourier-Transform Infrared Spectroscopy (FTIR). The thermal and mechanical properties of the composite were studied by Thermogravimetric Analysis (TGA), Universal Testing Machine (UTM) and Izod impact test. The findings revealed that the addition of  $\text{CaCO}_3$  had maximally improved the Young's modulus and strength of the composites at 5 phr  $\text{CaCO}_3$  loadings. Increased the stiffness and strength properties due to the addition of  $\text{CaCO}_3$  also has proven by the decreasing of elongation at break and Izod impact strength properties. In addition, incorporating  $\text{CaCO}_3$  in UPE/EPO resin also improved the thermal stability of the resulted UPE/EPO/kenaf composite. It can be concluded that addition of natural filler,  $\text{CaCO}_3$  in UPE/EPO resin is a promising steps to produce high performance UPE/EPO/kenaf composite.

**KEYWORDS**

Kenaf; Commercialized unsaturated polyester; Composite materials

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