**Evaluation of synthesized castor oil-based bio-binders for automotive composite materials production**

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**Abstract**

The development of polymers in various industries has been deteriorating due to the depletion in fossil fuels and environmental concerns such as the effect of greenhouse gases, global warming and increasing population. However, vegetable oils have emerged as a worthy replacement for fossil fuels. The need to use non-edible oils is recommended for industrial processes to reduce the dependency on edible oils and hence increasing food security. This investigation uses an affordable process to develop bio-binders for composite materials using non-edible oil produced from castor seed. The oil was first extracted from the castor seeds, purified and then process to yield castor oil-based bio-binders using Epoxidation method. The Epoxidation catalyst was synthesized from of tungstic acid and hydrogen peroxide at 50 - 60 °C. The Epoxidation process temperature varied between 60 and100 ᵒC while varying the catalyst loading and the reaction time. The epoxidized castor oil showed 70% binder yield with 1H NMR spectra showing peaks of an epoxy group at 3.0 – 3.2 ppm; and the epoxy peak was also observed using FTIR at 830 cm-1.