

# Optimization by RSM for the preparation of bioresin from palm oil

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## Abstract:

Synthetic resins are useful material for various applications, but they are majorly derived from petroleum and its derivatives. Petroleum derived products are usually nonbiodegradable, and production of them involves high manufacturing cost. During their processing, consumption of huge heat energy and emissions of greenhouse gases are common concerns. Vegetable oil is one of the renewable bioresources which can be used as an alternative of petroleum-based raw materials for the preparation of polymeric materials. Palm oil is largely-produced vegetable oil in the world and can be used in this purpose. In this research work, polyalkyd-based resin was prepared from palm oil by using polycondensation reaction. A two-step method viz. alcoholysis and esterification was conducted to synthesize polyalkyd-based resin. Prior to alcoholysis, crude palm oil was subjected for catalytic dehydration process to increase its unsaturation for the preparation of good quality alkyd resins. Response surface methodology was used to optimize the esterification reaction parameters like reaction temperature, reaction time, catalyst concentration, acid anhydride to mono-glyceride ratio and agitation speed. Result analyses through RSM revealed a desirability of 0.985, predicted reaction time of 88.64 min, catalyst concentration of 0.04 wt.%, agitation speed of 584.20 rpm and phthalic anhydride: mono-glyceride (PA:MG) molar ratio of 0.35:1 at reaction temperature 240°C. Moreover, 91.5% fractional conversion was achieved, which is close to the predicted value.

**Keywords** : Hyperheuristic ; Energy Management Strategy (EMS); Split Plug-In Hybrid Electric Vehicle (PHEV).

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