

Synthesis study of high oleic palm oil-based trimethylolpropane triesters: response surface methodology based optimization

ABSTRACT

The present study was carried out to optimize process parameters to reduce soap formation and maximize the yield of high oleic oleic palm oil-based trimethylolpropane triesters (TMPTE) synthesis by using response surface methodology (RSM). The selected affecting parameters were reaction temperature (90-140°C), reaction time (30-90 min) and concentration of sodium methoxide catalyst (0.28-0.60 wt%). The statistical analysis suggested that all single parameters had significant effects on TMPTE yield. However, only two single parameters (catalyst and temperature) had significant effects on the fatty soaps amount. All interactive parameters had significant impact on the TMPTE yield but only the interactive term of temperature and time showed the clear influence on the formation of fatty soaps. The optimum process conditions were obtained with high oleic TMPTE yield of 80.1 wt% and fatty soap product of 85.6 mg/g: sodium methoxide catalyst at 0.28 wt%; reaction temperature at 130°C; reaction time at 53 min.

Keyword: Trimethylolpropane triester; Biolubricant; Response surface methodology; Methyl ester; Saponification