**Synthesis and optimization of 2-ethylhexyl ester as base oil for drilling fluid formulation**


## ABSTRACT

A stable ester was synthesized to overcome the ester hydrolysis problem during the drilling of oil or gas wells using a conventional ester-based drilling fluid. The thermal and hydrolytic stability of the produced ester was high owing to the transesterification method employed in this study. The reaction was performed using 2-ethylhexanol and methyl laureate esters in the presence of sodium methoxide as a catalyst. In order to obtain the optimum synthesis conditions, a response surface methodology (RSM) was appraised based on the central composite design (CCD). The optimum conditions were determined as follows: 0.6 wt.% catalyst, 70°C reaction temperature, 1:1.5 molar ratio, and 11.5 min of reaction time. The results of 77 wt.% 2-ethylhexyl ester (2-EH) illustrated a high agreement between the experimental and RSM models. The reaction product contained 77 wt.% 2-EH and 23% 2-ethylhexanol. The kinematic viscosity was 5 mm2/s at 40°C and 1.5 mm2/sec at 100°C; the specific gravity was 0.854, flash point was 170°C, and pour point was ī 7°C. The produced product showed similar properties to the available commercial product. However, it was observed that the mud formulation using the synthesized base oil had superior rheological properties at 121°C.



**Keyword:** 2-ethylhexonal ester; Drilling fluid formulation; Methyl laureate ester; Response surface methodology (RSM); Rheology; Transesterification