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Central Composite Design Adoption for Assessing the TiO_2-POE Nanolubricant Dispersion Quality Using Response Surface Method

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Abstract

Stability is a major issue in every nanolubricant. The UV visible spectrophotometry approach is one method for assessing the dispersion quality standard of a nanolubricant. UV visible spectrophotometry is adopted to determine the absorbance level of a nanolubricant. This method assesses how well a nanolubricant absorbs UV rays emitted by a light source. A central composite design based on surface response was used to assess the influence of concentration and standing time on the absorbance ratio of TiO2-POE nanolubricant. The TiO2-POE sample was synthesized in two steps with a 0.02-0.2 vol% concentration range. A homogenizer was used to ultrasonicate the samples for 80 min. Then, U.V. visible spectrophotometry was used to examine the absorbance ratio of each sample from day 1 to day 15. Sixteen runs were performed to comply with a quadratic design for experimental data collection, then fitted using face canter alpha. The ANOVA analysis revealed that the experimental data fit the polynomial model, with an R2 value of 0.9902 and a model F-value of 201.91. This phenomenon confirms the significance of the model. The Predicted R2 of 0.9038 agrees reasonably with the Adjusted R2 of 0.9853. The findings suggest that the optimum concentration is 0.11 vol%, with an absorbance value of 0.990206 and a desirability level of 1.000.

Keywords: UV Vis; TiO2-POE nanolubricant; Response surface method; Dispersion quality; Stability.