

Comprehensive investigation of low proportion TiO₂-POE nanolubricant stability for residential air conditioning system application

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Abstract. The paper aims to expound on the comprehensive experimental investigation of the stability of TiO₂-Polyolester (POE) nanolubricant. A magnetic stirrer was used to disperse TiO₂ nanopowder into POE lubricant for 30 min. The six samples were then subjected to various ultrasonication treatments lasting 40-, 60-, 80-, 100-, and 120-min. Stability analysis was performed in three stages: visual observation, Ultra Violet (UV) visible spectrophotometric analysis, and measurement of the absolute zeta potential. The results showed that sample without ultrasonication treatment had substantial agglomeration as compared to other samples. The absorbance ratio of the sample without ultrasonication treatment is 0.33. The absorbance ratio value escalated as the duration of the ultrasonication treatment on the sample increases. After ultrasonication treatment for 40-120 min, the absorbance ratio increased by 34-117 %. The samples treated with 120 min of ultrasonication showed the highest level of stability, as evidenced by the high absorbance ratio and zeta potential values of 0.95 and -80.48 mV, respectively. As a result, the findings suggests that TiO₂-POE with ultrasonication treatment for 120 min could generate the excellent stability compared to other samples in this experiment.

Keywords: TiO₂-POE nanolubricant stability, interlude ultrasonication, UV visible spectrophotometry, zeta potential

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