Surface modification for dispersion stability of novel FAl_2O_3-POE nanolubricant using functional SiO_2

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Abstract. This paper aims to illustrate how the SiO_2 functionalization approach can modify the surface of Al_2O_3 nanoparticles. The effects of four different functionalization treatments on Al_2O_3 on the dispersion stability of FAl_2O_3-POE nanolubricant were significant. There are four samples with SiO_2:Al_2O_3 ratios of 15:85, 30:60, 45:55, and 50:50, respectively. Each sample was mechanically stirred for 120 min for the adsorption process. Then, each sample received a sub-inter critical annealing treatment at 120 °C in the furnace for 180 min, after which the samples were chilled using the gradual cooling approach to avoid thermal shock on the FAl_2O_3 nanoparticle surface. Newly synthesized FAl_2O_3 was dispersed in POE lubricant for 30 minutes with a magnetic stirrer and then ultrasonicated for 100 minutes to prevent agglomeration. On day 1 and 15, dispersing stability was examined using the UV visible spectrophotometry method. The results reveal that increasing the SiO2 ratio in the functionalization process enhances the dispersion stability of the FAl_2O_3-POE nanolubricant. The findings suggest that the FAl_2O_3-POE sample with a 50:50 ratio has the best dispersion stability, as shown by the highest absorbance ratio value of 0.945.

Keywords: Alumina surface modification, Functionalized Al_2O_3, FAl2O3 Dispersion stability, FAl_2O_3-POE nanolubricant

Acknowledgments:

This study was supported by the Helan Mountain Scholarship program from Ningxia University, China. The authors would like to thank Universiti Malaysia Pahang (UMP) for funding provided by the dedicated internal fund RDU190336 and the FRGS award RDU 1901112.

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