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Tribological Studies to Analyze the Effect of Solid Lubricant Particle Size on Friction and Wear Behaviour of Hard Material

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Abstract

In modern industry, mechanical parts are subjected to friction and wear, leading to heat generation, which affects the reliability, life and power consumption of machinery. The study of lubricant film formed between various geometric shapes are inherently complicated and interconnected, making it necessary to understand the concepts of tribological phenomena. To overcome the tribological losses due to friction and wear, use of lubricants with high viscosities and lower evaporation makes relative motion between two surfaces very smooth. Advancement in modern tribology has facilitated the use of applying solid lubricants in various industrial applications. Solid lubricants in ample thickness can effectively work under extreme conditions of temperature, loads and speeds. The effectiveness of solid lubricant particles strongly depends on the type of lubricant used in the suspension, solid lubricant particle size, and as well as concentration. In view of this, the present investigation aims to develop MoS_2 suspension with different weight fractions and to analyze tribological properties in order to make it suitable for most industrial applications. To characterize the same, an experimental setup has been developed to observe and measure the lubricant film thickness at various particles size and concentrations of solid lubricants. To determine solid lubricants Extreme Pressure (EP) properties of applied solid lubricants, EP test (ASTM D2783) experiments were performed on a four-ball tester. The results obtained from the experiments show the use of the solid lubricant with lesser particle size provide effectiveness thin film thickness in comparison with larger particle size. The results indicate that the optimum particle size and concentration of suspended MoS_2 solid lubricants improve the tribological properties in with an intended life time of the surfaces.

Keywords: *Friction, Wear, Solid lubricant, Molybdenum disulphide, Film thickness*

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