

Abstract

Waleed Ahmed Abdalglil Mustafa

Nanomaterials have emerged as future environmentally sustainable lubricant additives to improve conventional lubricants such as car oils, industrial oils, grease and metalworking fluids. In particular, as far as this thesis is concerned, nanoparticle additives' applications in transmissions oils are based on the concepts of solid lubrication and are often used as anti-wear, anti-friction, and high-pressure additives. Their multiple advantages include small enough scale, thermal stability, unique particle chemistries, mechanical properties, and a high surface reaction rate. These benefits translate into the prolonged running of the equipment, improved fuel efficiency and extended maintenance cycles. The main drawback of solid lubricant additives is the inherent low stability of liquid base lubricant systems, which has greatly limited them from industrial applications. Thus, the current PhD thesis is aimed to design novel techniques to improve the dispersibility of nanoadditives in base oils, while encompassing both the theoretical and the industrial point of view. The concluded results from this industrial research have shown promising results in simultaneous stability and tribological improvement. Also, future use of nanoadditives in electric vehicle applications is critically discussed, and key findings are achieved.