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# APPLICATION RELATED TO NANO LUBRICANTS

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**Abstract**

Nano science is a scientific effort towards achieving complete control over of atoms, molecules and larger atomic structures including surfaces and bulk material. This control at the most basic level does not, however, come without difficulty, and at this point basic science is struggling to understand even the simplest building blocks and how they interact. Once this understanding is secured, nanotechnology will be apt to affect every aspect of human life, from the way we produce energy to the way we cure diseases. The basis of all life is molecular motion.

**Keywords:** Nano, Science, Lubricants, Atom.

## Introduction

As the great physicist Richard Feynman (Feynman, Leighton et al. 1995) said, “If, in some cataclysm, all of scientific sentence passed on to the next generations of creatures, what statement would contain the most information in the fewest words? I believe it is the atomic hypothesis (or the atomic fact, whatever you wish to call it) that all things are made of atoms - little particles that move around in perpetual motion, attracting each other when they are a little distance apart, but repelling upon being squeezed into one another. In that one sentence, you will see, there is an enormous amount of information about the world, if just a little imagination and thinking are applied.”

Controlling the physical and chemical characteristics of the atoms and their interplay with other atoms in their surroundings. It also requires materials that will allow the manipulations to result in a broad range of properties. Metal oxides are proving to be a very interesting group of materials in this respect, because they cover the entire range of properties available; some are high superconducting while other are insulators, some are magnetic others not, and both their optical and mechanical properties vary a great deal.

## Review of Literature

Hiremath (2021) [1] An expanding area of research is the incorporation with nanoparticles into polymeric matrices by creating polymer nanocomposite with the goal of maximising the "nano-effect" received from the nanoparticles and minimising the drawbacks of the polymer. Polymers are combined with nanoparticles with form related to nanosheets, nanotubes, nanofibrils, and quantum dots to create polymer nanocomposites. These materials have adjustable mechanical, thermal, electrical, magnetic, and optical properties. However, it is crucial to make sure that the chosen nanoparticles are evenly dispersed throughout the matrix by having good compatibility alongwith matrix material in order to realise a high-quality composite. Thus, it is important to maintain careful control over the parameters used in the selection and operation of the polymer nanocomposites synthesis process.

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The publication provides an overview of the various fabrication methods used to produce polymer nanocomposites packed with nanoparticles. Also, an effort is made to comprehend how these nanoparticles affect the mechanical as well as thermal characteristics of polymer nanocomposites.

Ashraf (2018) [3] The effects of size and density on the quantity, surface area, stiffening effectiveness, & specific surface region related to nanoparticles with polymer nanocomposites are investigated in this study using a number of straightforward equations. Also, a number of equations are used to illustrate the roles that nanoparticle size as well as interphase thickness play in the interfacial/ interphase characteristics and tensile strength of nanocomposites. In nanocomposites, the aggregates as well as agglomerates related with nanoparticles are being also presumed to be big particles. Their effects on the tensile strength, interface/interphase properties, and nanoparticle features are examined. The number, surface area, stiffening effectiveness, & specific surface region related to nanoparticles are all positively impacted by their small size. The substantial interfacial area of 250 m2 between the polymer matrix and isolated, well-dispersed nanoparticles with a radius of 10 nm (R = 10 nm) and density of 2 g/cm3 is produced using only 2 g of these particles. Furthermore, because filler size as well as aggregates and/or agglomerates also regulate these terms, merely a thick interphase cannot create high interfacial/interphase parameters and important mechanical qualities in nanocomposites. It is discovered that the B interphase parameter is only improved to roughly 4 by a thick interphase (t = 25 nm) surrounding large nanoparticles (R = 50 nm), whereas B = 13 is attained by the tiniest nanoparticles with thickest interphase.

Shaoyun (2019) [2] Around three decades have passed since the discovery of polymer nanocomposites. In this study, the three fundamental areas of production, characterisation, and characteristics are critically evaluated in order to gain profound insights into the modifying impacts related with numerous nanofillers upon mechanical as well as physical characteristics related to polymer nanocomposites. The three main types of nanofillers-two-dimensional layered alongwith one-dimensional fibrous, and zero-dimensional (0D) spherical-are discussed in length in this paper along with their processing, characterisation, and physical characteristics. Several nanoscale fillers are first introduced, including two-dimensional (2D) nano-clay, graphene, and MXene, one-dimensional (1D) carbon type nanofibers & nanotubes, zero-dimensional (0D) silica nanoparticles, ZnO quantum dots, and nanofiller-polymer interfaces. These polymer nanocomposites are processed using various procedures, and several methods for characterisation related to nanofillers as well as polymer nanocomposites are discussed. The effects of the type, dispersion, and contents of the nanofillers are taken into consideration when discussing mechanical as well as physical characteristics related to these polymer nanocomposites. Additionally, the effects of the interface properties on the mechanical properties of polymer nanocomposites are discussed in some detail.

## Analysis

Nano particulate metal bunches/colloids are characterized as isolable particles in the nanometer measure go, which are kept from agglomeration by securing shells. They can be redispersed in water (hydrosols) or natural solvents (organosols). The quantity of potential uses of these colloidal particles is developing quickly due to the one of a kind electronic structure of the nanosized metal particles and their to a great degree vast surface territories (J. Turkevich, P.C. Stevenson et al, 1951). Very scattered mono and bimetallic colloids can be utilized as forerunners for a (Schmid, 1996). Nano particles, involved maybe a couple dierent metal components, are of significant enthusiasm from both the logical and innovative perspectives (Rodriguez and Goodman, 2002). Numerous endeavors have been made to create suitable procedures to get ready silver and titania nanoparticles for producing colloidal particles because of their innovative significance. Silver nanoparticles and titanium oxide molecule covering is a vital material because of its multifunctional application in sun powered cells, hostile to intelligent optical coatings, hydrophobic materials, photochromic and electrochromic gadgets, gas sensors, biosensors, erosion insurance, bactericides, optical gadgets, among others (Daoud and Xin 2004; Toma, Bertrand et al. 2006). One of the key issues that should be tended to in demonstrating plainly visible mechanical conduct of nano-organized materials in light of atomic structure is the extensive contrast long scales. On the contrary end of the length scale, the range of computational science and strong mechanics comprises of very created and dependable demonstrating techniques. Computational science models anticipate sub-atomic properties in view of known quantum associations, while computational strong mechanics models foresee the plainly visible mechanical conduct of materials glorified as nonstop media in light of known mass material properties. In any case, a relating model does not exist in the middle of the road length scale extend. In the event that a progressive approach is utilized to demonstrate the plainly visible conduct of nano-organized materials, at that point a strategy must be created to interface the atomic structure and naturally visible properties. They additionally rely upon the molecule estimate dissemination. These property changes emerge from the expanding impact of surface properties in contrast with volumetric mass properties as the molecule estimate diminishes.

Particularly nanoscaled particles demonstrate adjusted properties and have in this way across the board applications like colors, pharmaceuticals, beauty care products, earthenware production, impetuses and filling materials. Since the coveted item properties may change with molecule estimate and with the level of total or the total structure, controlling of the PSD and the total structure is a key model for item quality. As good as ever items would then be able to be composed by altering and enhancing the PSD and the molecule structure. Precipitation is a promising strategy for the monetary creation of business amounts of nanoparticles as it is quick and operable at an encompassing temperature. Be that as it may, process control because of the speed of the included sub-procedures and particularly to anticipate total through adjustment speaks to a test.

To control these sub-forms, adjust models are utilized as a part of molecule innovation. Populace adjusts for agglomeration and breaking down show up in an extensive variety of utilization including nano-innovation, granulation, crystallization, barometrical science, material science and pharmaceutical businesses. There are a few numerical strategies, for example, Monte Carlo, Finite component, Fine volume, sectional ways to deal with illuminate the agglomeration and breaking down populace adjust conditions [5-7].

## Conclusion

The stability related to nanoparticle dispersion considering fluid phase is the key issue that manufacturers of nanolubricants currently face (at the laboratory scale). To prevent fouling and sedimentation, which might hinder the transit related with nanoparticles into system, stability is a crucial factor. Moreover, filter and expansion device clogging as well as deposition at another components are both potential risks to the system's performance, specifically the expansion valve. Agglomerates, or big clusters related to nanoparticle material, may also degrade a system's lubrication by increasing wear and friction on moving surfaces. In this context, techniques including ultrasonic agitation, homogenization, high shear mixing, and magnetic force agitation are utilised to assure the dispersion related to nanoparticles at lubricant alongwith minimum possibility on deposition rate. Some authors have discovered that, for a specific amount of time, it is possible to establish nanolubricant stability considering without sedimentation at 3-20 days by using direct or indirect ultrasonication and magnetic agitation. Avoiding the formation of agglomerates, collisions, and the subsequent cohesion between nanoparticles will increase the stability of nanolubricants. For this, the Waals forces during the Brownian motion must be smaller than electrical repulsive kind of forces related to nanoparticle surface layer. Hence, the steric stabilisation approach, in which surfactants enclose the nanoparticles in reverse micelles, can be employed to achieve this goal.

## Conflicts of Interest

The authors declare there are no significant competing financial, professional, or personal interests that might have influenced the performance or presentation of the work described in this manuscript.

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