

# Advances in Nanotechnology Related to the Chemical Industry

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## Introduction

Pop culture has claimed nanotechnology to be the ‘next big thing’ as it has been linked to many fan-favorite movies. However, research done in nanotechnology has dated back to “Plenty of Room at the Bottom,” a presentation done by Richard Feynman in 1959. This indicates that nanotechnology is not an upcoming field of research, instead, it has been developed through years of research. Scientists now define nanotechnology as a type of technology that fits three qualities. Something can only be identified as nanotechnology if the size of the atom at the molecular level is in the range of 1-100 nanometers, the item is useful when it is small, and scientists can control the atom when it is in its nano-size [1].

Countries throughout the world have been interested in nanotechnology as it can solve problems related to energy production, safe drinking water, agriculture, and medical problems [1]. Although nanotechnology seems to be safe and effective, there are still some questions regarding the testing for the toxicity of nanotechnology. Walker and Bucher came up with four different reasons why nanomaterials should not be tested for toxicity in the same way other materials are. One of their reasons is that the size of nanomaterials, although can be a benefit, may also be a drawback as they may enter new routes which can be toxic. Another reason is that the commercialization of nanotechnology may lead to new interactions between the nanomaterials and other objects leading to toxicity. As of 2015, there was no standard test for measuring the toxicity of nanoparticles [2]. Regardless of this, nanotechnology seems to be promising as it has many different uses and can be used in a variety of industries.

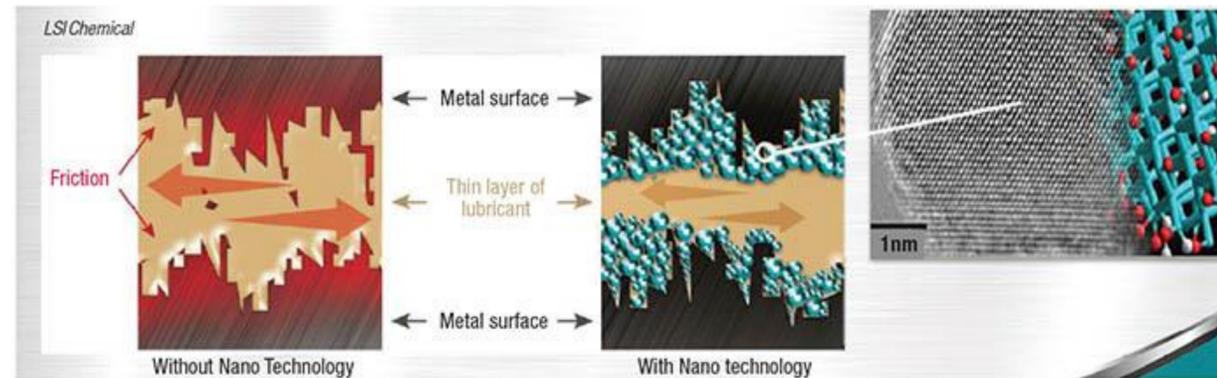


Figure 1 indicates that with the application of nanotechnology in lubrication, friction decreases due to the nano-polymer layer protecting the metal surface [3].

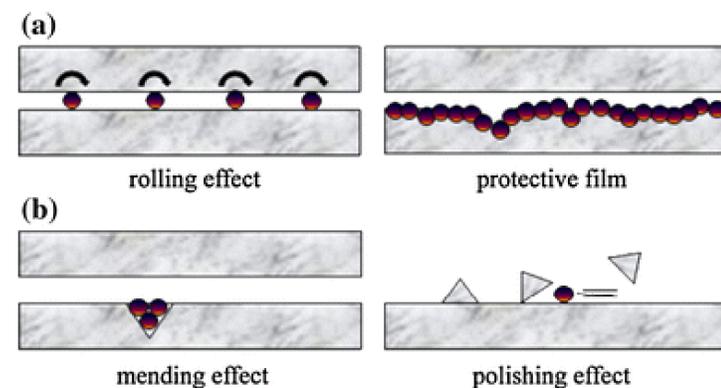


Figure 2 indicates the different effects on lubricants [4].

## Conclusion

The commercialization of nanotechnology has been viewed as a challenge for the better part of the 21<sup>st</sup> century. Recent advances in nanotechnology made by engineers, scientists, and mathematicians have allowed for nanotechnology to grow. Nanotechnology has been used in a multitude of industries where it has seemed to prosper. One industry where nanotechnology has seemed to prosper is in the petroleum industry where nanoparticles were found to improve lubrication.

## Why is Nanotechnology used in Lubrication?

Lubrication is used in many industries to prevent machinery from wearing down due to friction or scarring. Lubrication decreases friction and reduces wear on machinery, therefore, expanding the lifespan of the machine. It is well known that nanotechnology can be particularly useful in enhancing lubrication. Nano-polymers, like nano molybdenum, were found to improve the tribological factors of lubrication when it is added to lubricants. Additionally, nano-polymers improve resistance, have low density, and increase the coefficient of friction at a cheap cost. Overall, the size and concentration of the nano-polymers allow for them to be an effective lubricant additive [5].

## Effect of Nanoparticles on Lubricants

When in lubricants, nanoparticles can have a rolling effect, mending effect, polishing effect, or a formation of a protective film, as shown in figure 2. The effect nanoparticles have on lubricants can be determined by a disc-on-disc tester which allows for the lubricant to be applied between the fixed plate and the rotating plate. These effects are proven when the coefficient of friction decreases due to the addition of the nanoparticles in the lubricant [4].

## References

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