

Next-Generation of Tribological Lubricants Modified with Magnetic Nano-Microwires

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Nowadays, there is a high interest in developing new advanced lubricants that improve the performance and life-service of the materials, by reducing friction coefficients and wear rates [1].

It has been shown that one of the strategies that pays off for improving the tribological properties of lubricants is the addition of nanoparticles, which act as nano-bearings, thanks to the formation of a protective film that decreases the contact between surfaces [2].

In this work a commercial lubricant (Shell Donax TD 10W-30) has been modified by selectively incorporating of different magnetic metallic nano and microwires (Ni-NWs, Fe-Nws, Co-MWs, Figures 1-3) synthesized by Fundación IDONIAL. The experimental results obtained on AISI 430 stainless steel substrate are highly promising, showing that the novel nanolubricant significantly improved anti-wear tribological properties in relation to unmodified oil. Tribological tests have been performed on a tribometer in *pin-on-disc* configuration.

Additionally, these advanced lubricants are environmentally friendly, due to the fact that metallic additives can be separated by an external magnetic field and subsequently they can be reused.

References

- [1] Holmberg K., Kivikytö-Reponen P., Härkisaari P., Valtonen K., Erdemir A. Global energy consumption due to friction and wear in the industry. *Tribol. Int.* 2017, 115, 116–139.
- [2] Gulzar, M.; Masjuki, H.H.; Kalam, M.A.; Varman, M.; Zulkifli, N.W.M.; Mufti, R.A. Tribological performance of nanoparticles as lubricating oil additives. *J. Nanoparticle Res.* 2016, 18, 223.

Figures

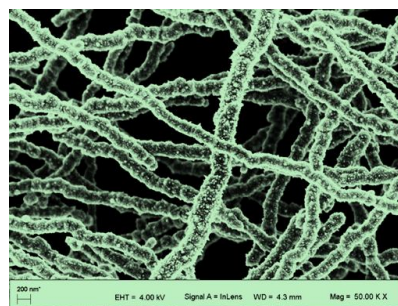


Figure 1: FEG-SEM Images of Niquel Nanowires

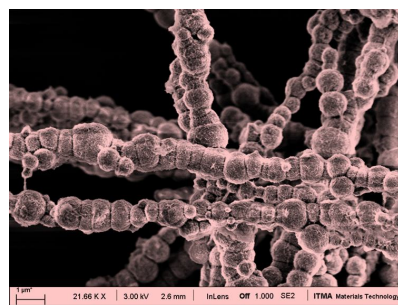


Figure 2: FEG-SEM Images of Cobalt Microwires

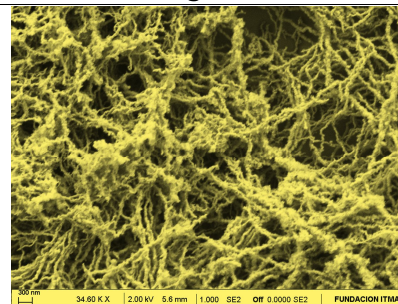


Figure 3: FEG-SEM Images of Iron Nanowires