# Fullerene-Like Inorganic Nanoparticles (IF WS2) - Novel Grease EP Additive

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## Synopsis

Tungsten disulfide (WS2) along with molybdenum disulfide (MoS2 – moly) have been known as a lubricious particles for many decades. These particles, in its conventional form, have platelet morphology (with irregular geometries) and lamellar type of structure.

Novel fullerene-like inorganic nanoparticles of tungsten disulfide (IF WS2), due to controlled geometry, size and unique morphology, outperform platelet type particles in any application. Introduction of IF WS2 nanoparticles to grease reduces COF and wear up to 2.5 times and increases EP properties of grease up to 3 times. The mechanisms of friction and wear reduction are described below:

1. Spherical nanoparticle with a hollow core have high impact strength: up to 35 GPa (5076 ksi) and act as a damper at applications with high loads and impact
2. Nano sized particles smooth a surface, covering roughness irregularities and asperities
3. The spherical geometry allows nanoparticles to play a role of a nano ball bearings, creating a roller friction
4. The spherical geometry has no dangling bonds and is chemically inert
5. Multi-layer onion-like structures of IF WS2 nanoparticles start exfoliating under high pressures and create thin protective film on the friction surface.