Lubricants

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Advances in Water-Based Nanolubricants

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Energy conservation and environmental protection face unprecedented challenges in modern manufacturing, highlighting the critical need for green manufacturing and sustainable development. Lubrication plays a vital role in minimizing energy loss caused by friction and wear in engineering applications. However, conventional oil-based lubricants pose significant environmental concerns due to their non-biodegradable nature and inherent toxicity, making recycling a major challenge. In contrast, water is a clean, low-cost, and recyclable lubricant, but its corrosive properties and low viscosity limit its broader application. To address these limitations, recent research has focused on enhancing water's lubricity through the dispersion of nanomaterials as nanoadditives, aided by eco-friendly surfactants. Water-based nanolubricants have emerged as a promising alternative to conventional oil-based lubricants, including pure oils, oil-in-water emulsions, and oil-based nanolubricants, offering significant benefits for sustainable manufacturing. This Special Issue highlights the latest advancements in experimental and modeling research on novel water-based nanolubricants in tribology and related emerging fields.

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