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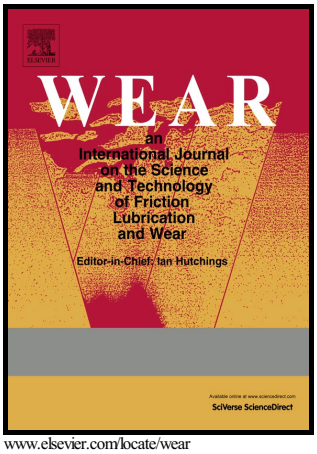

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Tribochemical Induced Wear and Ultra-low Friction of Superhard ta-C Coatings

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Keywords

Ultra-low friction; superlubricity; chemical wear; diamond, ultra-hard materials; Carbon-based coatings (inc. DLC); Tribochemistry; Boundary lubrication

Highlights

- Ultra-low friction properties of fatty acid-based lubricants were investigated
- Wear and friction of ta-C, a-C, and diamond was compared
- Strong influence of lubricant and temperature suggests chemical wear of ta-C
- Wear promoting factors are studied and discussed
- Low contact pressure promotes low friction of fatty acid-based lubricants

Abstract

Employing a broad parameter study, friction and wear properties of amorphous carbon coatings (a-C), tetrahedral amorphous carbon coatings (ta-C) and single crystalline diamond were investigated in boundary lubrication regime, using an oscillating ball-on-flat test setup with engine oil, glycerol, and glycerol monooleate (GMO) lubrication. Ultra-low friction (μ < 0.04) was confirmed with glycerol and GMO. At the same time, very high wear of the superhard ta-C coating was found for GMO solely.

A systematic study of lubricant chemistry, surface impurities, testing temperature, counter body material, and the carbon coating regarding sp^3-fraction and crystallinity