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Nanolubricants; Contents; Preface; List of Acronyms; 1 Colloidal Lubrication; 1.1 Stability of Colloids Dispersed in a Base Oil; 1.2 Lubrication by Micellar Systems; 1.3 Lubrication by Metallic Nanoparticles; 1.4 Colloids Embedded in a Coating; References; 2 Nanoparticles Made of Metal Dichalcogenides; 2.1 Tribological Properties of 2H-MoS<sub>2</sub>; 2.2 IF-MoS<sub>2</sub> and IF-WS<sub>2</sub> Fullerene-like Nanoparticles; 2.3 IF-MoS<sub>2</sub> and IF-WS<sub>2</sub> as Additives in Boundary Lubrication; 2.3.1 IF-MoS<sub>2</sub>; 2.3.2 IF-WS<sub>2</sub>; 2.3.3 Other Fullerenes; 2.4 NT-MoS<sub>2</sub> and NT-WS<sub>2</sub> Nanotubes as Lubricant Additives 2.5 Lubrication by a Mixture of Fullerenes 2.6 Tribological Properties of Mo-S-I Nanowires; 2.6.1 Influence of the Nanowire Concentration in PAO on the Tribological Properties; 2.7 Raman Tribometry on IF-MS<sub>2</sub>; 2.7.1 In situ Observation of the Structures in the Interface; 2.7.2 Raman Tribometry; 2.8 Lubrication Mechanism of IF-MS<sub>2</sub>: 'A Drug Delivery' Model; 2.9 Conclusion; Acknowledgements; References; 3 Carbon-Based Nanolubricants; 3.1 Graphite Onion Synthesis and Characterization; 3.2 Tribological Properties of Different Carbon Onions; 3.3 Possible Lubrication Mechanism of Carbon Onions 3.4 Nanotube Synthesis and Characterization 3.5 Friction-Reducing and Antiwear Properties of Different Nanotubes; 3.5.1 SWNTs; 3.5.2 DWNTs; 3.5.3 MWNTs; 3.6 Possible Mechanism of Action of the Nanotubes; 3.7 Conclusion; Acknowledgements; References; 4 Reverse Micelles and Encapsulated Nanoparticle Approaches; 4.1 Introduction; 4.2 Overview of the Structures of Stoichiometric and Overbased Soap Additives; 4.2.1 Dynamic Organic Micelles; 4.2.2 Dynamic Soap Micelles; 4.2.3 Encapsulated Nano-Sized Particles, also Called 'Overbased Reverse Micelles' 4.3 Behaviour of the Micelles at the Solid-Liquid Interface 4.4 Tribologic Properties of Colloidal Systems; 4.4.1 Friction Reduction Properties of Micelles Related to Their Structure; 4.4.2 Antiwear Action Mechanisms of Colloidal Systems; 4.4.3 Nature and Structure of Antiwear Films Obtained with Strontium and Calcium Compounds; 4.4.4 Associated Antifriction and Antiwear Actions in Tribological Behaviour of Colloidal additives; 4.5 Conclusion and Perspectives; References; 5 Nanolubricants Made of Metals; 5.1 Introduction; 5.2 Nanolubricants Made of Coinage Metal Nanoparticles 5.2.1 Organic Compound Surface-Capped Copper Nanoparticles as Oil Additives 5.2.2 Copper Nanoparticles Passivated by Carbon Film Used as Oil Additives; 5.3 Nanolubricants Made of Low Melting Point Metal Nanoparticles; 5.3.1 Nanolubricants of Indium, Tin and Bismuth via the Direct Solution-Dispersing Method; 5.3.2 Nanolubricants of Lead and Bismuth via the Surfactant-Assisted Solution-Dispersing Method; 5.4 Nanolubricants Made of Low Melting Point Metal Alloy Nanoparticles; 5.4.1 In-Sn, Bi-In and Pb-Bi Nanoparticles Prepared by the Direct Solution-Dispersing Method 5.4.2 Sn-Bi and Sn-Cd Alloy Nanoparticles Prepared by the Ultrasonic-Assistant Solution-Dispersing Method

**Sommario/riassunto**

The technology involved in lubrication by nanoparticles is a rapidly developing scientific area and one that has been watched with interest for the past ten years. Nanolubrication offers a solution to many problems associated with traditional lubricants that contain sulphur and phosphorus; and though for some time the production of nanoparticles was restricted by the technologies available, today synthesis methods have been improved to such a level that it is

possible to produce large quantities relatively cheaply and efficiently.  
Nanolubricants develops a new concept of lubrication,

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