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Biotribological model systems for emerging nano-scale technologies

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Man has done research in the field of tribology for several thousands of years. Nature has been producing lubricants and adhesives for millions of years.

Biotribologists gather information about biological surfaces in relative motion, their friction, adhesion, lubrication and wear, and apply this knowledge to technological innovation as well as to development of environmentally sound products.

Ongoing miniaturization of technological devices such as hard disk drives and biosensors increases the necessity for the fundamental understanding of tribological phenomena at the micro- and nanometer scale. Biological systems excel also at this scale and might serve as templates for developing the next generation of tools based on nano- and micro-scale technologies.

Examples of systems with optimized biotribological properties are: articular cartilage, a bioactive surface which has a friction coefficient of only 0.001 [1]; adaptive adhesion of white blood cells rolling along the layer of cells that lines blood vessels in response to inflammatory signals [2]; and diatoms, micrometer-sized glass-making organisms that have rigid parts in relative motion, and might serve as model systems for innovations in micro- and nanotechnology [3,4].

Keywords: biotribology; articular cartilage; rolling adhesion; diatoms; tribology; low friction coefficient; biomimetics; adaptive adhesion; applied nanobioscience.

References

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