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New generation superhard carbon coating or a new approach to improving oil lubricity

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A new approach to oil lubricity improving is considered. It bases on changes in molecular structural ordering of adsorbed oil boundary layers governed by a highly oriented solid substrate. Among diamond-like coatings with varying structure there are some ones (with monocrystalline or polycrystalline structures) having orientation effect on molecular ordering of lube oils what leads to decrease in friction coefficient. It is shown that orientating and adsorption effects of carbon coatings can be intensified by additional active centers creation on their surfaces, particularly by nitrogen atoms doping. The tribotests had shown better antifriction properties of nitrogen doped coatings at various contact loads both under dry friction and under friction in lube oils as compared with that of amorphous carbon coating and uncoated steel.

In the paper a new type of carbon coatings is considered having no analogs, which can provide essential reducing of power losses in lubricated tribounits. Efficiency of these coatings is based on the established by the author's fact that the carbon coatings with monocrystalline highly ordered structures and linear chains of carbon increase essentially the level of molecular ordering in lubricating boundary layers and ensure adsorption of boundary layers on the coatings.

The pioneer results were obtained showing that intercalation of carbon monocrystalline carbon leads to remarkable reducing of friction under tests with lubrication by model lube oils. The suggestion is made that mechanism of friction reducing while doping by nitrogen is connected with increasing number of adsorption centers on coated surfaces and intensification of coating orientation effect on molecular structural ordering in boundary layers.