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Application of DLC films deposited by plasma CVD for effective protection of flexible substrates

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Friction processes between balls and rubber are the major source of energy loss during normal operation of ball bearings. Therefore, a proper lubrication of these pieces would represent an important benefit for industry. However, the specific nature of rubber determines the characteristics of the film which has to be deposited and restricts the deposition parameters. In this work, we have deposited DLC films on different types of rubber by means of plasma-assisted CVD. We have found that the friction coefficient is dramatically decreased when comparing with unprotected rubbers (by a factor between 5 and 10), or with oil protected rubbers (by a factor of 2). Besides, rubber wearing, which is the principal reason of failure of ball bearings, is practically reduced to zero. The influence of bias voltage and deposition temperature on the DLC film microstructure is studied in detail. It will be shown that the tribological properties and flexibility of the film can be optimized by a proper control of the crack network during film growth. The role of the viscoelastic properties of the rubber substrates on the friction behavior of the whole coated systems is also discussed.

Keywords
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