

## Tribological Behaviour of Diamond-like Carbon Coatings in Hydrogen

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This abstract will present preliminary results obtained during Antti Vaajoki's researcher visit with I<sup>2</sup>CNER, Kyushu University between September and December 2012.

Carbon thin films such as Diamond-like Carbon (DLC) coatings have been studied extensively for many years and they are already utilized in applications where low friction and low wear are needed. Yet, the understanding of the tribological behaviour of the carbon coatings in hydrogen environment is limited. This information will be needed when utilization of hydrogen becomes more popular.

This study concentrates on the tribological behaviour of two types of diamond-like carbon coatings, hydrogen-free ta-C and hydrogenated a-C:H, sliding against bearing steel (ultra-pure 100Cr6) in hydrogen environment. The tests were performed using the pin-on-disc (POD) tribometer that has a chamber which allows experiments to be carried out in vacuum and in different gas environments (e.g. nitrogen, hydrogen, argon). The equipment was equipped with devices to monitor the gas impurity levels (water and oxygen) for the gas exiting the chamber. Experiments were carried out in different impurity levels of hydrogen i.e. the water impurity level was varied by using filters and moisturizer. The tribological behaviour was evaluated by analysing the friction coefficients, wear surfaces and wear debris.

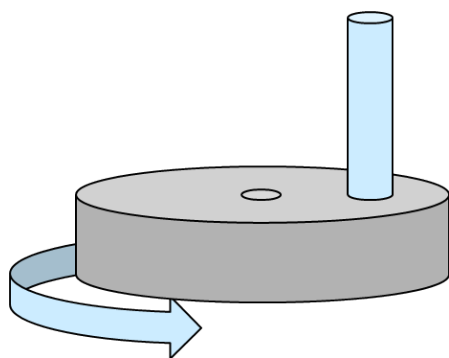


Figure 1. Schematic diagram of a pin-on-disc experiment



Figure 2. Disc and pin specimens

Based on the preliminary results, it can be concluded that increasing the water impurity level of hydrogen did not show significant effect on the friction levels of either ta-C or a-C:H type DLC coatings when sliding against 100Cr6 pins. However, some delamination of the a-C:H type coating could be observed during the POD experiment.

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