

## Friction and Wear of Organosilane Monolayer Film on Diamond-Like Amorphous Carbon Surface

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### ABSTRACT

Organosilane monolayer is being experimented as possible wear resistant protective coatings for diamond-like carbon (DLC) on magnetic hard disks. Friction tests were carried out on a spin-stand designed for contact-start-stop tests, using 3 mm diameter glass ball slider. The glass ball was slid on the organosilane monolayer deposited DLC surface under a normal load of 20 mN. During the test, the glass ball slider was oscillated horizontally on the disk surface, while in contact, approximately between the radii of 14 mm and 19.5 mm at a frequency of 5 Hz producing a wear track of about 4-5 mm width. The disk rotational speed was maintained at 1000 rpm. The organosilane monolayer film was studied before and after the sliding tests using contact angle measurements, ellipsometry, and x-ray photoelectron spectroscopy (XPS), and compared to similar results on perfluoropolyether nanolubricant films. Followings are the results of this study. The contact angle values before and after wear tests on the organosilane monolayer coated surface were unchanged. It means that the organosilane monolayer is not worn during the wear test and still covering the disk surface with high coverage which is comparable to that before wear test. This result is in contrast to similar measurements on PFPE lubricated DLC where the contact angle changes in the worn zone indicating a depletion of the lubricant and exposure of bare DLC. Whereas the ellipsometric measurements show that the film thickness of the organosilane monolayer decreases about 0.5 angstroms after wear test and XPS results shows that the ratio of C-F and C-C peak area decreased slightly after wear experiments. This implies that the organosilane monolayer that was vertical against the carbon surface before the wear test was only tilted due to the sliding actions of the glass ball and no removal of the monolayer occurred during the test.