

Micro-tribology properties of the PFPE Coated on Hard Disk Evaluated by Force Modulation  
Method.

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Abstract

To reduce the probability of head-crash in higher density magnetic systems, a new extremely thin protective layer against wear and corrosion must be applied on magnetic head-disk interface. Durability evaluation of lubricant and DLC (Diamond-like Carbon) film compound layer was investigated. With regard to hard disks coated DLC film and PFPE (Perfluoropolyether), their surface micro-tribological properties such as storage modulus, loss modulus and  $\tan \delta$ , etc. have been evaluated by AFM (Atomic Force Microscope). It is concretely said that the characteristics of visco-elasticity related with the existence of lubricants on the valley and hill parts of the hard disk surface and the lubricant following function after micro-wear test were estimated with the force modulation method. Visco-elasticity test is performed under the conditions of load 10-50 $\mu$ N, frequency 300Hz, and load amplitude 5.0 $\mu$ N, and micro-wear test is done with scan area 500x500nm<sup>2</sup> and load 10-80 $\mu$ N. The main results of above mentioned tests are as follows.

[1] Viscosity properties like loss modulus and  $\tan \delta$  are higher in valley parts than in hill parts. It is considered that the viscosity is corresponding to the existence quantity of lubricant.

[2] The wear of hard disks coated PFPE has shown to decrease after micro-wear test and all of  $\tan \delta$  in hill parts of surface is almost not changed as evaluating its viscosity. On the other hand,  $\tan \delta$  in valley parts decreased under a high load in micro-wear test. It is thought that lubricants have been removed.