EFFECT OF MATING MATERIAL ON FRICTION AND WEAR PROPERTIES OF a-C:H DLC IN BOUNDARY BASE OIL LUBRICATION

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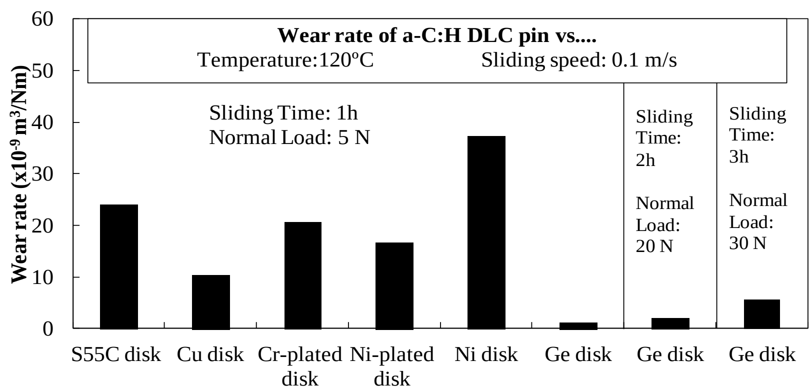
ABSTRACT

Increasing energy demand of the human society is a serious concern on sustainability of the Earth's ecology due to environment pollution and global warming. Diamond like carbon (DLC) hard coatings are being researched about extensively for decades now, as a solution for reducing energy consumption in modern industry, due to their mechanical and tribological properties, in order to understand those properties, and related mechanisms[2]. Literature broadly reported about ultra-low friction coefficient in boundary lubrication with DLC coatings, and also about a large number of wear mechanisms to occur in a DLC coating involved tribosystem. Broadly speaking, these mechanisms can be classified into physical and chemical processes, and the major ones are adhesive wear, abrasive wear, fatigue wear, corrosive wear, or diffusion wear. In most cases, and depending of involved material, several wear mechanisms occur simultaneously, and it is difficult to ascertain specific proportional contributions to wear from different mechanisms [1-3]. In light of the current state of research about DLC coatings, several questions remain unanswered:

Evaluate the FRICTION & WEAR behaviors of DLC coatings against different materials,

- How DLC coatings display different friction coefficient against different counterpart materials and what factors are related to the low friction mechanism.
- What factor characterize the low friction coefficient of DLC coatings in pure PAO oil or with additive.
- Wear mechanism and related factors of DLC coating
- Why does DLC coatings show lower wear rate against some mating materials than others
- Why does DLC coatings hardly wear against some mating materials than others
- What are the best mating materials for DLC coatings in boundary base oil lubrication.

Thus in our research we will try to give answers and explanations to above mentioned questions, by characterizing friction and wear behaviors of a-C:H DLC coating against various materials, in order to classify selected materials according to tribological behaviors that a-C:H DLC coating exhibit when they are involve with in a tribosystem. First results reveal that a-C:H DLC coating show surprisingly low wear rate against one of the chosen counterpart materials as we can observe in the following figure.



By further investigating, we will try elucidate the tribological behaviors of a-C:H DLC coatings form a material to another, especially against germanium (Ge) material, we will try to understand which properties of Ge induce such low wear rate of a-C:H DLC film. At the end, we will try to enlighten the scientific and industrial world about materials that are the best counterpart material against selected a-C:H DLC coating, in terms of low friction and wear resistance.

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