

Study of GMO concentration on the boundary lubricated W-doped DLC coatings

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1. Introduction

DLC coatings are very promising in engine components applications as they are seen as an alternative approach towards reducing the dependence on some high SAPS additives. W-doped hydrogenated DLC coating seems to be more chemically reactive compared to other non-doped DLC coatings. Understanding the interactions between such a coating and lubricant additives is essential for the optimization of lubricant formulation.

2. Method

In this study, conventional organic friction modifier GMO-containing lubricants with different additive concentrations are studied by a reciprocating test rig with a W-DLC/cast iron tribological system under boundary lubrication regime. Interfaces of the tribological system are further analyzed by the following aspects,

- 1) Quantification of carbon sp² content by Raman spectroscopy and electron energy loss spectroscopy (EELS).
- 2) SEM/EDX chemical mapping of the worn region for the interactions between the surfaces and additives.
- 3) FEGSEM/EDX chemical mapping of the cross-sectional interfaces of the worn region for the tribological film study based on the additives with different concentration.

3. Results

Single GMO-containing lubricant with a relatively lower concentration suffers from higher wear whilst a higher concentration reduces the friction and wear of the tribological interface under the same test conditions. The cross-sectional interface/tribological layers of the WDLC coating are characterized by SEM as is shown in Figure 1. Detailed discussions as proposed in the above methods will be further discussed.

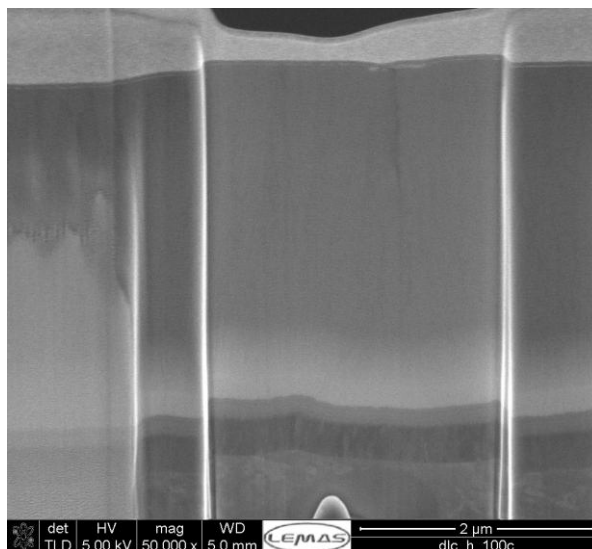


Figure 1 Cross-sectional SEM tribological layers image of the wear scar region. (*W-DLC/CI interface, GMO of a higher concentration, 2hrs, 100 °C*)

4. References

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