UNDERSTANDING OF THE GLAZE LAYER FORMATION: APPLICATION TO A HS25/ALUMINA CONTACT SUBJECTED TO FRETTING WEAR AT HIGH TEMPERATURE

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ABSTRACT

The purpose of this study is to investigate the formation mechanisms of glaze layer during high temperature fretting wear. The studied contact is a cobalt-based alloy against an alumina sample subjected to fretting. The operating temperature varies from 100°C up to 600°C. Wear volume analysis shows that a protective third body is spontaneously created at the interface for high temperatures (T>400°C). The excellent tribological properties of the so-called "glaze layer" leads to an unworn regime.

Microstructure observations at the nanoscale were performed and revealed that the high temperature third body is composed of layers with different grain sizes, chemical compositions and mechanical properties. However, these layers do not appear at the same time at the interface and do not behave equally during fretting. Fig. 1 presents the tribolayer composed of the Effective Glaze Layer (EGL), the Oxidized Debris Layer (ODL) and the Chromium-Rich Layer (CRL). In the light of these results, a high-temperature fretting wear mechanism will be proposed and discussed.

Moreover, previous studies [1,2] showed that the wear behaviour of this tribosystem is well described by an original wear law based on abrasion, oxidation and sintering processes [1,2]. This previous work is extended to predict the glaze layer formation for various tribological parameters. Finally, it is proposed to formalize the glaze layer formation through some "glaze layer maps", as presented in Fig. 1.

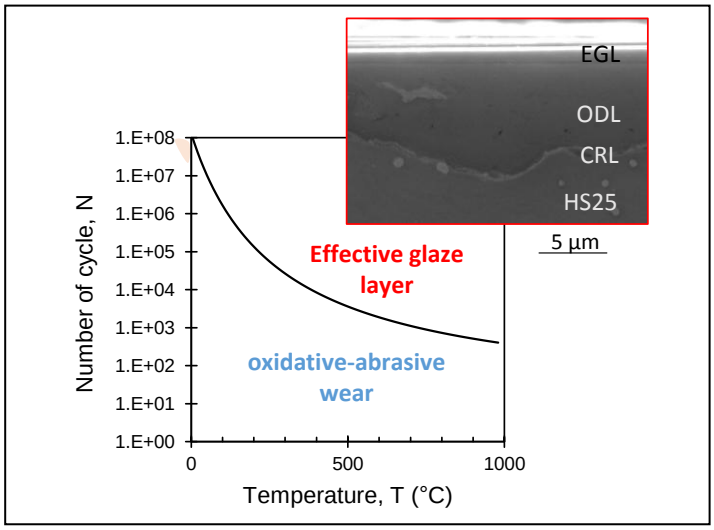

Fig.1 Prediction of the glaze layer formation and SEM observation of the high-temperature tribolayer

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REFERENCES

[1] Dreano, A., Fouvry, S. and Guillonneau, G., Tribol. Int., 125, 2018, 128-140.
[2] Dreano, A., Fouvry, S. and Guillonneau, G., Wear, 2019.