Self-Competing and Coupled Effect of Laser Engraved Counterface Groove Depth, Density and Directionality on Wear of Alumina PTFE

CATEGORY OR KEYWORDS
Wear; Alumina PTFE; Roughness; LST; Self-competing effect

AUTHORS AND INSTITUTIONS
Jiaxin Ye, Kaisen Zhang, Tianyan Gao, Yifan Zhang, Xiaojun Liu, Kun Liu*
Institute of Tribology, School of Mechanical Engineering
Hefei University of Technology
Hefei, Anhui, China

INTRODUCTION
Recent works found lapped counterface roughness perpendicular to the sliding direction could significantly improve debris retention and reduce the wear of an alumina PTFE solid lubricant by 70%. In this paper, we aimed to test the independent effects of roughness groove depth, density and directionality on debris retention and wear performance of a well-studied alumina PTFE solid lubricant using laser textured counterfaces. Grooves were textured parallel or perpendicular to the polymer's sliding direction and with independently varied depth and interval. A new surface directionality parameter was defined to quantify surface directionality before and after the wear test (Figure 1).

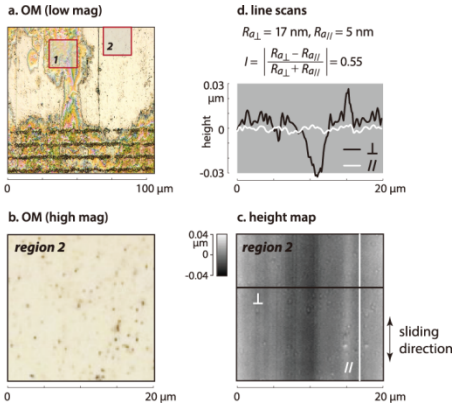

Figure 1.

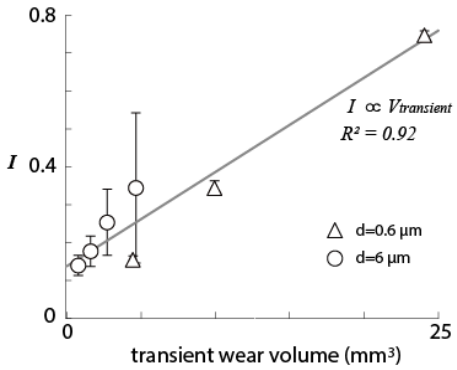

Figure 2.

The results suggested both groove depth and interval have self-competing effect on wear due to the in-situ grounding of the counterface topography during sliding. Groove direction, surface directionality and wear are also strongly correlated (Figure 2). A conceptual framework was proposed to illustrate the relations between counterface texture, polymer wear, surface directionality and counterface abrasion [1].

ACKNOWLEDGMENTS
The authors gratefully acknowledge financial support from the National Natural Science Foundation of China (51875153, 51875152 and 51505117) and the Natural Science Foundation of Anhui Province (1608085QE98).

REFERENCES

[1] Ye, J., Zhang, K., Gao, T., Zhang, Y., Liu, X., Liu, K., "Self-Competing and Coupled Effect of Laser Engraved Counterface Groove Depth and Density on Wear of Alumina PTFE," Tribology Letters (under review).