LOADING RESPONSE TO FRICTIONAL STIMULUS APPLIED TO A FINGER SLIDING AGAINST GLASS SURFACES STRIPED WITH A MOLECULAR LAYER

Y. Liu [a], S. Aoki [a*]
*saoki@chemeng.titech.ac.jp
[a] Department of Chemical Science and Engineering, School of Materials and Chemical Technology, Tokyo Institute of Technology,
S1-31, 12-1 O-okayama 2-chome, Meguro-ku, Tokyo 152-8552, Japan

KEYWORDS
Biotribology; Everyday life tribology; Friction; Tactile perception

ABSTRACT

The frictional behavior between a finger pad and a solid surface is a common phenomenon in our daily life, such as in the process of touching, grabbing or browsing through a touch screen. Tactile perception is generated in these processes, which is believed to bond a strong connection between frictional phenomena. Thus, the study on frictional behaviors of a finger and dynamic responses to different frictional stimuli may provide us with vital information about the truth of tactile sensations.

The study on the correlation between finger friction and tactile perception often involves a friction test of a finger against solid surfaces with various surface features. In this study, glass surfaces coated with a self-assembled monolayer of octadecyltrichlorosilane (OTS-SAM) in different stripe-patterns were adopted as the specimen in three sets of friction tests with a total participants' number of 18. OTS-SAM has been proved to show a well friction modifying nature in previous studies [1,2]. Half of the surface on each specimen was coated with OTS-SAM, the widths, intervals or the orientation of the stripes being different. When the participants slid their fingers on the specimens, a change in friction force was recorded together with the change in normal load, a factor that quantifies the dynamic response to the frictional stimulus.

The first friction test involves specimen with striped molecular layers vertical to the sliding direction of the finger, with different stripe widths and intervals, yielding various molecular film coverage. Figure 1 shows that the rate of change (ROC) in interfacial shear strength caused by such molecular layers highly depended on the coverage of OTS-SAM, with a higher coverage inducing a lower friction. An increasing tendency of the normal load was observed with the decrease of shear strength, as the response to the frictional stimulus.

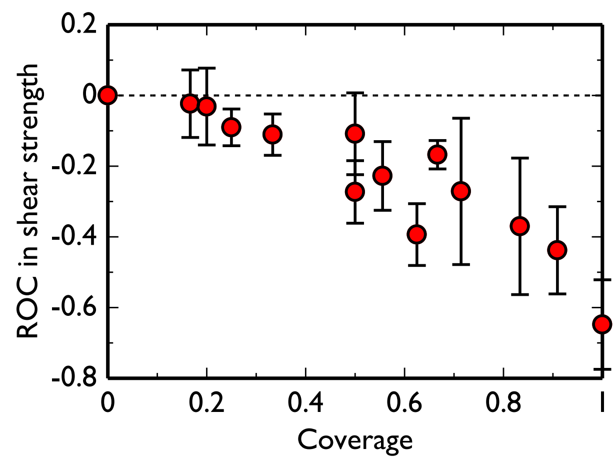

Fig. 1 Plots of ROC in interfacial shear strength against film coverage in patterned surfaces

ACKNOWLEDGMENTS

This work was supported by JSPS KAKENHI Grant-in-Aid for Scientific Research (C) Number 16K06040. This work was approved by the Ethics Committee of Tokyo Institute of Technology for Number 2016091. Written informed consent was obtained from each study participant.

REFERENCES

[1] Yanagisawa R, Aoki S, and Masuko M., Tribol. Online 11, 2016, 396-402.
[2] Yanagisawa R, Aoki S., Tribol. Int., Accepted.