Synopsis of Original Research Paper

Tactile evaluation of cosmetic products using biomimetic tactile evaluation system

Yoshimune Nonomura

Yamagata University

Nonlinear phenomena on the soft material surface are one of the most exciting topics of chemical physics. However, only a few reports exist on the friction phenomena under accelerated movement, because friction between two solid surfaces is considered a linear phenomenon in many cases. We aim to investigate how nonlinear accelerated motion affects friction on solid surfaces. In the present study, we evaluate the frictional forces between two polytetrafluoroethylene (PTFE) resins using an advanced friction evaluation system. On PTFE surfaces, the normalized delay time δ, which is the time lag in the response of the friction force to the accelerated movement, is observed in the pre-sliding friction process. Under high-velocity conditions, kinetic friction increases with velocity. Based on these experimental results, we propose a two-phase nonlinear model including a pre-sliding process (from the beginning of sliding of a contact probe to the establishment of static friction) and a kinetic friction process. The present model consists of several factors including velocity, acceleration, stiffness, viscosity, and vertical force. The findings reflecting the viscoelastic properties of soft material is useful for various fields such as in the fabrication of clothes, cosmetics, automotive materials, and virtual reality systems as well as for understanding friction phenomena on soft material surfaces.