STICK–SLIP MODE OF BOUNDARY FRICTION

N. N. Manko – *Sumy State University, postgraduate student*
G. S. Ilyina – *EL Edvisor*

The study of the boundary friction processes that develop in nanosized tribosystems has drawn active interest of many researchers. One of the perspective directions is the investigation of the friction of atomically smooth solid surfaces in the presence of an ultrathin film of a homogeneous lubricant between them. The interest is partially due to the applied significance of these systems, as they are used in increasing frequency to design precise devices and instruments.

This work presents the subsequent development of the synergetic model, which describes the state of an ultrathin lubricating film clamped between two atomically smooth solid surfaces during boundary friction. It has been found that the use of this model can make it possible to describe the behavior of various types of tribosystems. The stick–slip mode frequently observed in experiments has been described. Under this mode, consecutive transitions between the structural states of the lubricant occur. This work makes it possible to extend the results obtained in the synergetic model of the previous studies, as the described stick–slip mode has a deterministic nature. This has not been shown previously, but is observed in numerous experiments on studying the boundary friction processes. It has been found that, the stochasticity in the system grows together with the temperature elevation of the friction surfaces. When the temperature exceeds a critical value, the system follows the mode described by the Lorentz attractor. In the wide range of parameters, the reverse motion of the rubbing surfaces occurs. Our results agree qualitatively with known experimental data. In all modes studied a similar transient mode was shown to occur in a definite range of initial conditions. This mode involves damped oscillations and the subsequent stick of the surfaces together for a long time, then a stationary mode of friction sets in. If the initial conditions are the abovementioned range, the transient mode is governed by the system parameters.

Соціально-гуманітарні аспекти розвитку сучасного суспільства : матеріали IV Всеукраїнської наукової конференції викладачів, аспірантів, співробітників та студентів факультету іноземної філології та соціальних комунікацій, м. Суми, 19-20 квітня 2013 р. / Відп. за вип. В.В. Опанасюк. — Суми : СумДУ, 2013. — Ч.4. — С. 20.