

# Modelling of wear and contact fatigue in friction interaction

Irina Goryacheva<sup>1\*</sup>, Elena Torskaya<sup>1</sup>

<sup>1</sup>A. Ishlinsky Institute for Problems in Mechanics of Russian Academy of Sciences,  
119526, Vernagского prosp.,101-1, Moscow, Russia

\*goryache@ipmnet.ru

**Keywords:** friction contact, stresses, damage accumulation, fatigue wear

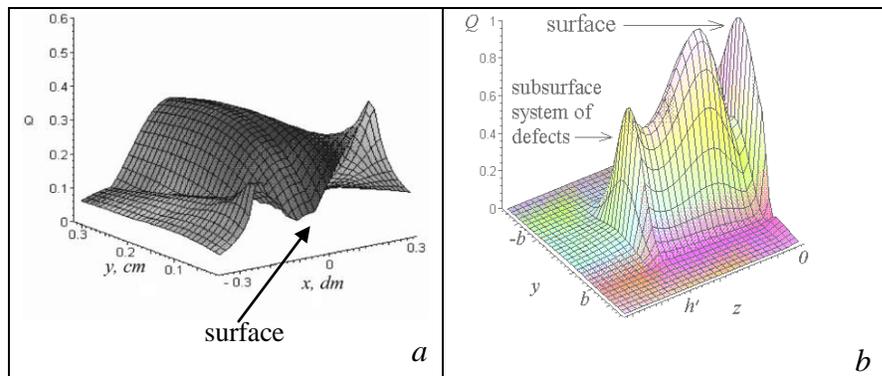
**Introduction.** The long-term of machine units, which operate in friction conditions, depends on their resistance to wear and to contact fatigue. Wear is the fracture of thin surface layers at micro-level; it has different nature for various friction conditions (adhesion, abrasion, contact fatigue caused by roughness, etc). For some cases wear is accompanied by contact fatigue which is the fracture due to damage accumulation in subsurface layers leading to crack initiation.

## Steps of modeling.

- Experimental study of wear and contact fatigue for given friction pair.
- Surface analysis, determination of the main mechanisms of the contact fracture.
- Contact problem solution, calculation of internal stresses within the surface layers.
- Calculation of damage function for multi-cycle loading [1]

The last step should be done taking into account the evolution of the contact surface shape in wear process [2]. In the case of fatigue type of wear the damage function is calculated at micro-level taking into account the surface roughness [1], [3].

**Analysis of wear and contact fatigue for different junctions.** The approach was used to study the main features of the contact fatigue process in cyclic sliding/rolling contacts of different types of bodies (homogeneous, coated bodies, the bodies with subsurface defect layer, etc.). Figure illustrates the non-dimensional damage function for a homogeneous body (*a*) and a body with subsurface defect layer (*b*).



**Acknowledgments.** The research was financially supported by the Russian Foundation for Basic Research (projects 11-01-00650a and 09-08-01236-a).

1. Goryacheva I.G. Contact Mechanics in Tribology. Kluwer Academic Publishers, Dordrecht, 1998.
2. I. G. Goryacheva, S. N. Soshenkov & E. V. Torskaya (2011): Modelling of wear and fatigue defect formation in wheel–rail contact, Vehicle System Dynamics, DOI:10.1080/00423114.2011.602419
3. Goryacheva I.G., Torskaya E.V. Modeling of fatigue wear of a two-layered elastic half-space in contact with periodic system of indenters, Wear, 286 (11-12), 1417-1422.