Abstract

Contact of peaks of flat rough one and two-process texture with spherical and flat surface

In the thesis on the basis of theoretical analyses and experimental investigations characteristics of summits contact of one- and two-process textures with flat and spherical surfaces were compared. The special attention was paid to inclination to plastic deformation.
In the beginning of the thesis a literature survey was done concerning ball contact with flat rigid surface and rough textures contact with flat and spherical surfaces. Functional significance of stratified surfaces was also taken into consideration.
The aim and scope of research were formulated, research methods and equipment were described.
In theoretical part, ball contact with flat rigid surface was analysed. In this scope analytical models of elastic-plastic contact based on FEM and theoretical models with some modifications were compared, method of contact load modeling for known contact area was also presented.
In main theoretical part, modeling of elastic-plastic contact of flat rough textures was done. For various surfaces of Gaussian ordinate distribution the results of application of different analytical models without and with asperity interaction and numerical method were compared, the effect of averaging mean radius of peaks curvature as well as sampling interval selection on contact parameters were analysed. Proposal of plasticity index calculation of two-process textures was elaborated. The effect of topography on contact characteristics of one- and two-process textures was studied.
Contact parameters of one- and two-process surfaces with ball were studied theoretically, using two modeling methods.
The research stand was developed in order to study experimentally normal contact of spherical copper and steel surfaces with flat surface from sintered carbide. On the basis of results of contact research the analytical model of contact was recommended. This stand was used for contact of steel rough textures with silicon carbide flat surface. The results of research proved significant of peak parts from two-process texture.
Tribological experiments were also done in order to analyse wear of rough steel discs with spherical surface of higher hardness with different normal loads in dry friction conditions using pin-on-disc tester. Wear of steel discs was also studied in contact with flat ring of higher hardness. In both cases discs surfaces had different topographies of one- and two-process structures. It was found that wear of disc with two-process textures in contact with spherical surface could be smaller than that with one-process topographies of the same roughness height. The attempt of explanation of rough discs wear in contact with flat and spherical surfaces is practical aspect of conducted research. In two analysed cases the strong correlations between modeled and real discs volumetric wear were obtained.
The investigations made within the range of the thesis allowed to draw final conclusions which confirm reaching aim of the thesis.

Keywords: surface topography, one- and two-process textures, rough surface contact, wear