

OR0805

Influence of substrate pretreatment and Bias voltage on the tribological behavior of a-C-coatings under wet conditionsWolfgang Tillmann¹, Evelina Vogli¹, Fabian Hoffmann¹¹LWT, Technische Universität Dortmund, Dortmund, Germany

wolfgang.tillmann@udo.edu

DLC coatings are characterized by their outstanding wear resistance and low coefficients of friction. Their tribological performance is strongly depending from the environmental circumstances. Though the friction and wear behavior of hydrogen-free a-C coatings declines under dry conditions compared to the a-C:H-systems, they demonstrate very good wear resistance and friction behavior under wet circumstances, which derive from passivation of the free σ -bonds by water molecules. Besides the layer design, process parameters and the treatment of the substrate material play also an important role in improving the wear resistance and the friction behavior under different environmental circumstances.

This paper focuses on the influence of the substrate pretreatment and different bias voltages on the tribological behavior of the a-C-coating system under wet conditions. Therefore the substrate material was treated by plasma nitriding using an arc-PVD-device (physical vapor deposition) prior to the coating process in a magnetron-sputter-process at different bias voltages from 75V to 200V. The morphology of the coating system has been analyzed by means of field-emission scanning electron microscopy (FE-SEM), while a Raman spectrometer was used to determine the sp^2/sp^3 bonding concentration of the coatings. Tribological tests under different humid conditions were performed on a ball-on-disc-tester. These results give information about the impact of the substrate pretreatment and process variations on the wear resistance and friction behavior of the coatings.

Keywords

DLC

tribological behavior

bias voltage

substrate pretreatment

wet conditions