STUDY ON THE INFLUENCE OF THE NORMAL LOAD ON THE COEFFICIENT OF FRICTION AND WEAR OF THERMOPLASTIC MATERIALS IN DRY SLIDING CONDITIONS

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It is widely accepted that the tangential force in sliding pairs is proportional to the applied normal load. For polymers, this is valid for a broad range of normal load values while the relationship between normal and frictional force breaks down on either side of that range. [1] The friction force is the sum of the deformation and adhesion components. At low loads, the deformation part becomes very small and can be neglected. [2] The adhesion part and the transition to the mixed regime is examined in experiments with varying loads in a ball-on-plate as well as a pin-on-disk setup. The tested materials are two different thermoplastics with different melting and glass transition temperatures. The aim is to describe the frictional behavior of thermoplastic materials at relatively low contact forces and at different stress states. The pin-on-disk setup causes constant pressure and shear stress in the material as a polymeric pin is in contact with a flat steel disk while the ball-on-plate setup causes a more complex stress state as the flat, polymeric samples are in contact with a steel ball. The governing mechanisms during wear and its quantity as well as the coefficient of friction are compared for both materials, especially regarding their different glass transition temperatures, and setups.

[1] Myshkin, N.K., Petrokovets, M.I., Kovalev, A.V., Tribology of polymers: Adhesion, friction, wear, and mass-transfer, Tribology International 38, 2005: p. 910-921

[2] Kalácska, G., An engineering approach to dry friction behaviour of numerous engineering plastics with respect to the mechanical properties, eXPRESS Polymer Letters Vol.7, No.2, 2013: p. 199–210