Conclusion

Strength and durability are crucial properties of polymeric materials. The strength of actual materials is not a material constant, due to fact that it depends on many factors: time or speed, action of load, temperature, type of stress state, etc.

All the valuable physical properties of polymers in the highly elastic state, which determine their wide application in engineering, are due to the structural features of their macromolecules and the supramolecular structures. Progress in the field of tribology of elastomers based on polymers is associated with the solution of a number of important problems that make it possible to reveal meso- and nano-mechanisms of physical processes occurring on the working surfaces of friction pairs. In this regard, it is important for science and practice to study the structural transformations at the molecular and supramolecular multiscale levels in the surface layers. It is necessary to create more advanced calculation methods based on physical prerequisites involving synergetics and fractals, methods of the physical meso-mechanics and the dimensional reduction and many other issues. It is necessary to solve the boundary value problems of linear viscoelasticity in order to take into account the hereditary-temporal properties of the components of the stress-strain state. Stresses, deformations, displacements arising in a linear viscoelastic body under the action of boundary loads can be calculated by solving integral-differential equations systems describing the quasistatic equilibrium of a structure. This will allow the actual dimension of the problem to be increased by one in comparison with the elastic calculation. It is necessary to analyze the physical basis of the strength of elastomeric materials and their strengthening methods due to dispersed-filled fillers.

In order to generalize perennial theoretical and experimental studies, it is necessary to analyze the physical and mechanical properties of nanostructured dispersed-filled composites based on the elastomeric matrices and the carbon-containing nano- and micro-size particles.

The list of such methods can be continued. The authors showed that all complex and interesting problems can be solved thanks to the joint efforts of scientists of various specialties.

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