DESCRIPTION FOR THE GENERAL PUBLIC

Polyurethane elastomers possess a great advantage over polymers in abrasion resistance. They are the most abrasion-resistant of all polymeric materials. Polyurethane Elastomers are materials that offers an unique combination of properties (excellent rubber elasticity, good mechanical properties, enhanced abrasion resistance) which enable products to be manufactured to meet a range of demanding applications. They are the most commonly used in tribological systems where increased abrasion resistance is required, for instance: conveyor belts elements, aggregate separation screens or wheels for industrial trucks but also in industries such as aerospace and military for the most severe applications.

Prediction of wear properties of synthetic materials, especially polyurethane elastomers, is very difficult due to the wide variation in their properties. The use of various raw materials, at various amounts or employing various production methods and various methods for further processing all that gives a chance to produce polyurethane elastomers with strongly varied properties. For example, hardness of the final products mainly depends on the content of hard segments. Hardness of the material is greater when the content of hard segments is higher. Nevertheless, the relationship between the content of hard segments and abrasive wear is more complicated. In general, for most materials relation between hardness and an abrasion resistance is quite simple. If a material has higher hardness it will be more resistant to abrasive wear. Therefore, users of polyurethane elastomers are convinced that there is a relation between hardness and abrasion resistance. However, preliminary studies carried out in the Institute of Materials Science at West Pomeranian University of Technology in Szczecin do not confirm this thesis. The results of the study showed that polyurethane elastomers, with the same hardness, could strongly differ with the wear resistance. It has been shown that the differences in abrasive wear are substantial (even more than 20 times for materials with the same hardness). Probably this is due to differences in the composition of raw materials. Which means that the decisive factor in the wear resistance of polyurethane elastomers is not their macroscopic hardness but the chemical structure and morphology.

The lack of data, which could enable prediction and modeling of abrasion resistance of polyurethane elastomers, is a very extensive problem. There are two quite different ways to solve this problem. The first way is to determine the wear mechanisms occurring during the different testing methods and parameters. The second way is to determine the effect of chemical structure and morphology of polyurethane elastomers on their abrasive wear resistance. Both issues have not yet been fairly well described. The research project aims to advance the understanding of the effects of varying chemical composition of model polyurethane elastomers on: their morphology and the resulting abrasive wear resistance properties. In this study a number of polyurethane elastomers will be synthesized using the most common raw materials of various chemical structure. Characterization of physical structure of polyurethane elastomers obtained from various raw materials, linking its chemical structure to the properties will contribute to a broader understanding of the phenomena occurring during exploitation of polyurethane elastomers in friction pairs.