# TECHNOLOGICAL ASPECTS OF THERMOPLASTIC NANOCOMPOSITE MATERIALS OBTAINING

*S. Audzeichik, Head of the Department of Material Science and Resource-saving Technologies*
***Yanka Kupala State University of Grodno***

Fluoroplastics and fluorine-containing composites are among the most widespread polymeric materials used for the manufacture of sealants and tribological products for static and mobile units with high technical requirements . However depending on operating conditions, required resources, security settings can be used in products such as the basic polymer, particularly, polytetrafluoroethylene (PTFE) and of the compositions on their base, containing dispersed and fibrous fillers, modifiers, and functional additives of various composition, production technology and size.

Most common in engineering, including the manufacture of compressor and vacuum equipment, products of the composites (CM) of which there are short fragments of glass, carbon, aramid, basalt fibers, graphite powders, including heat-split (TSG), carbon and graphite nanoparticles of detonation synthesis (UDAG, UDAV), fluorinated carbon black (FC), fullerenes (FL), carbon nanotubes (CN), metal powders, oxides, ceramics and other compounds of metals and nonmetals, natural and synthetic carbon and silicon compounds - coke, mica, clays, zeolites, tripoli. The range of fillers and modifiers of composites based on fluoroplastic is wide and constantly changing due to the expansion of their range of practical applications in engineering, transportation systems, liquid and gaseous media, chemical synthesis and life support systems. The increasing use when creating fluorine-containing composites receive nanosized fillers with unique modifying effect on the polymer matrix.

Wide usage in tribological composites received polytetrafluoroethylene, combining high levels of strength, tribological, physical, chemical and thermal characteristics that distinguish it from other types of polymer materials, especially thermoplastic. However, this material, as well as composites based on it, has a number of peculiar characteristic features that limit the practical application of products from it, especially in tribotechnics.

During the investigation developed a method of forming products (semi-) from fluorine-containing composites, the essence of which is to activate the contact processes in the boundary layers of the system "PTFE-matrix-filler" by the use of mechanochemical processes in the contact zone of components due to the difference of indexes of their thermal physical characteristics. According to this method provides an integrated effect of increasing the strength and tribological characteristics. For example, the rupture stress index $\sigma_t$ of composite based on PTFE containing 20 wt.% carbon fiber, in processing of the developed technology, reaches a value of 22-35 MPa at an identical index $\sigma_t$=17MPa for articles from a composite of similar composition, formed by traditional process . The effect of hardening, probably due to the total effect of normal and tangential stresses at the interface of the "matrix-filler", which leads to interaction macroradikal products of PTFE tribocreaking with the active centers of the filler and reduce defects in the boundary layer by filling of modifier particle microroughnesses by the matrix polymer as a result of mechanochemical plasticization.