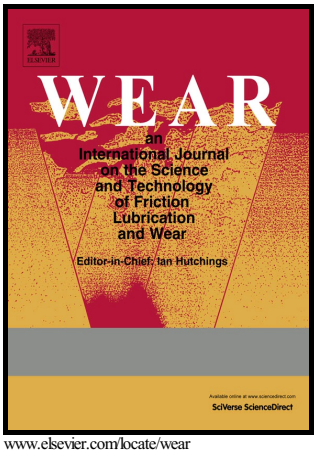


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V.N. Aderikha, A. P Krasnov, A.V. Naumkin, V.A. Shapovalov

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# EFFECTS OF ULTRASOUND TREATMENT OF EXPANDED GRAPHITE (EG) ON THE SLIDING FRICTION, WEAR RESISTANCE, AND RELATED PROPERTIES OF PTFE-BASED COMPOSITES CONTAINING EG

**V. N. Aderikha[1+], A. P, Krasnov[2], A. V. Naumkin[2], V. A. Shapovalov[1]**

[1]V.A. Belyi Metal Polymer Research Institute of the National Academy of Sciences of Belarus, 32a Kirov str., Gomel, 246050, Belarus
[2]A.N. Nesmeyanov Institute of Organoelement Compounds, Russian Academy of Sciences, Vavilova St., 28, Moscow, 119991, Russia

*The effect of ultrasound treatment of expanded graphite (EG) on structure and tribological behavior of PTFE-EG composites filled with 5 mass % of EG is studied. It is found that sonicated EG ($EG^S$) increases the friction coefficient of PTFE composite compared to that of the composite filled with the original EG ($EG^O$). Filling with EG allows to reduce the wear rate of PTFE up to a factor of ≈700 to $K_w \approx 6\times10^{-7}$ $mm^3/Nm$ depending on the friction conditions. At high sliding velocity causing high frictional heating, the wear rate of PTFE-$EG^S$ composite is several times higher than that of PTFE-$EG^O$ owing to reduced thermooxidative stability of both $EG^S$ and PTFE-$EG^S$ composite, whereas at friction regimes with small frictional heating the wear rates of the two composites are similar.*

*It is also found that the wear rates reduce with the increasing content of iron carboxylates in the friction layer of the composites, which evolve from interaction of the counterface steel with the products of PTFE tribochemical degradation. The counterface steel is transferred onto the friction surface of the composite specimen in the form of spherical particles of micrometer-nanometer size range according to SEM and electron probe analysis. Chemical bonding of the fine steel particles to the tribochemically modified macromolecules of PTFE reinforces the running film and improves the wear resistance of the composites. Both the content of transferred iron and the wear resistance of PTFE-EG composites increase significantly with the increase in the relative humidity of the ambient air.*

*EG filler aggregates delaminate at friction into thinner platelets of nanographite which may accumulate in the friction surface layer of the composites. Accumulation of the filler is more expressed in highly wear resistant composites and has an additional effect on reduction of the wear rate.*

***Keywords:*** *expanded graphite, PTFE composite, wear, iron carboxylates, tribochemical mechanism*



## 1. Introduction

Layered carbon nanofillers – graphene, graphene oxide, nanographite draw elevated attention of researchers in various fields of science, including the material science, owing to a unique set of properties inherent to these derivatives of graphite [1-3]. High cost of the single layer graphene and the absence of high output technologies for its production impede its application in material science, promoting instead the use of the multilayer graphene and graphene oxide, often represented in such studies by various modifications of expanded graphite (EG).