



Proposals of
**the department of technologies
of fats and fermentation
products** of the National
Technical University "KhPI"
for joint research in the field of
food technologies



The Department of Technologies of Fats and Fermentation Products

- The head of the department:
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Graduate programs:

- ✓ Bachelor of Science in Food Technology
- ✓ Master of Science in Food technology
- ✓ Ph.D. in Food technology





The department deals with enzymatic energy-efficient production technologies of functional fats and food emulsions on their basis that have dietary and treatment-and-prophylactic properties

Our ongoing scientific projects:

1. Acylglycerols conversions by applying enzymes.
2. The research of enzymatic acylglycerols modification involving ethyl esters of fatty acids.
3. The scientific basis and process development for the production of novel generation of confectionery and cooking functional fats.
4. The scientifically-practical bases of functional fats technology.

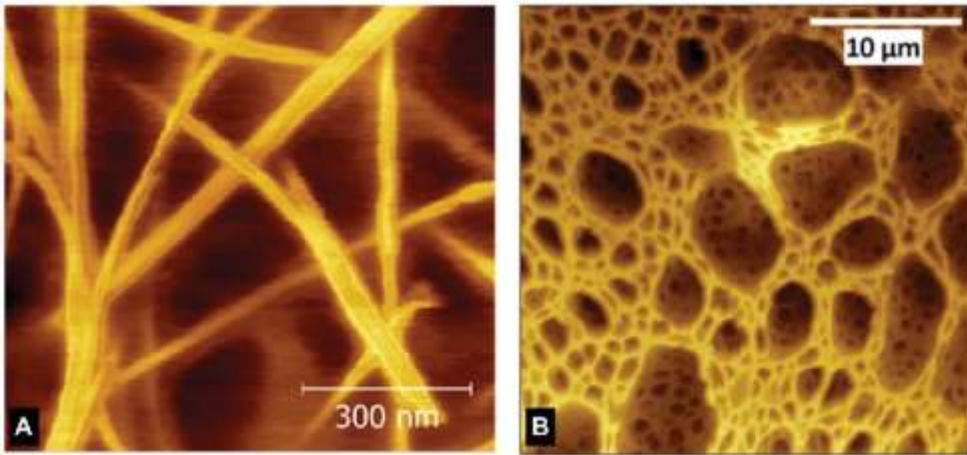




Key publications:

1. Nekrasov, P., Tkachenko, N., Makovska, T., & Lanzhenko, L. (2016). Optimization of formulation composition of the low-calorie emulsion fat systems. *Eastern-European Journal of Enterprise Technologies*, 3/11 (81), 20–27. (Scopus).
2. Nekrasov, P., Piven O., Nekrasov O., Gudz, O., & Kryvonis, N. (2018). Kinetics and thermodynamics of biocatalytic glycerolysis of triacylglycerols enriched with omega-3 polyunsaturated fatty acids. *Voprosy Khimii i Khimicheskoi Tekhnologii*, 5, 31-36. (Scopus).
3. Nekrasov, P., Gudz, O., Nekrasov, O., Kishchenko, V., & Holubets, O. (2019). Fatty systems with reduced content of trans-fatty acids. *Voprosy Khimii i Khimicheskoi Tekhnologii*, 3, 132-138 (Scopus).
4. Nekrasov, P., Gudz, O., Nekrasov, O., & Berezka, T. (2020). Optimizing the parameters of the production process of fat systems with a minimum content of trans-isomers. *Voprosy Khimii i Khimicheskoi Tekhnologii*, 3, 128-133 (Scopus).



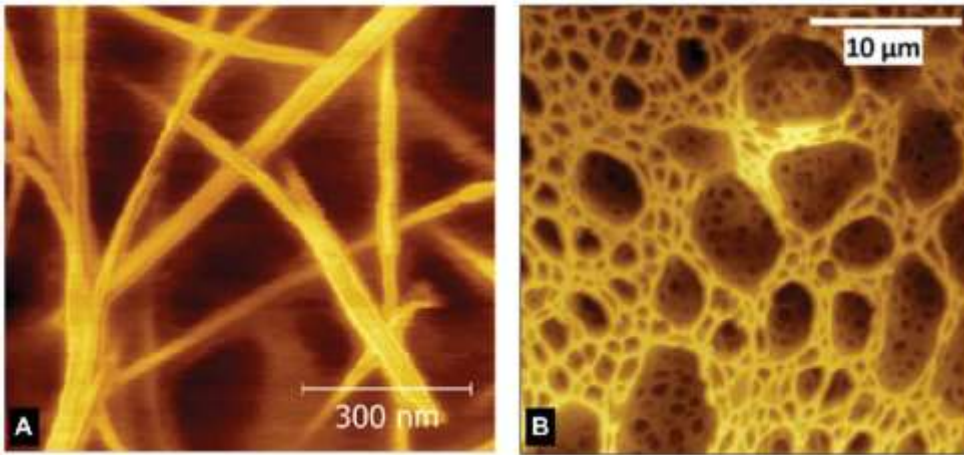


Our proposals for the scientific collaboration

Scientific and practical substantiation of the methodology of production of fatty systems with a minimum content of trans-isomers

In recent years, a new concept of nutrition, the main condition of which is not only a pleasant taste of food, but also its safety and usefulness for the human body, has been formed around the world, including countries of the European Union, where this issue is considered in the rank of public policy.

Currently, the global market is filled with food products based on fats, which are produced by the method of partial hydrogenation and, as a result, have a high content of undesirable spatial isomers of natural unsaturated fatty acids – trans-isomers. The results of many studies have shown that trans-isomers of fatty acids disrupt the functioning of enzymes and cell membranes in the human body, increase blood cholesterol, and raise the risk of heart disease. Introduction of the fully hydrogenated fats technology is the only way to avoid the formation of trans-isomers during hydrogenation, but a high melting point of such fats complicates their direct usage for food production. Consequently, the use of processes that do not lead to the formation of trans-isomers is the best solution to the issue of high trans fatty acids content.



Our proposals for the scientific collaboration

Scientific and practical substantiation of the methodology of production of fatty systems with a minimum content of trans-isomers

The purpose of the study is a scientific and practical substantiation of the methodology of production of fatty systems with a minimum content of trans-isomers of fatty acids in two ways. The first one is biocatalytic modification of fats, supplemented by an optional fractionation. The second one is the creation of a new generation of fatty systems, namely oleogels.

Within the framework of the project, it is proposed to perform the following tasks:

- to carry out complex studies of the kinetics of biocatalytic processes that underlie the production technology of fatty systems with a minimum content of trans-isomers;
- to develop mathematical models that allow to determine the optimal conditions for biocatalytic interesterification of fats and predict the consistency of the transformation products on the basis of data on their component composition;
- to substantiate the rational prescription composition of oleogels as one of the types of fatty systems with the minimum content of trans-isomers.



Our proposals for the scientific collaboration

The creation of scientifically-practical bases of enzymatic energy-efficient production technology of cocoa butter equivalents (CBE)

The novelty of the project is the suggestion about the application of ethyl esters of fatty acids, mostly stearic acid ethyl esters, as functional ingredients in food products which contain fat. This proposal makes it possible to significantly increase their digestibility and inhibit process of fat resynthesis in the human body. According to the expert council of the FAO / WHO «Fats and fatty acids in human nutrition» [<http://www.fao.org/3/a-i1953e.pdf>] fatty acids such as lauric, myristic, palmitic acids (in the food) increase the level of LDL cholesterol, while stearic acid doesn't have an affect on the content of LDL cholesterol in human blood plasma.

It is proposed to produce fat that contains acylglycerols which structure is similar to cocoa butter acylglycerols by interesterification of sunflower oil with fatty acids ethyl esters, preferably the ethyl esters of stearic acid. The obtained CBE will have dietary and treatment-and-prophylactic properties that can solve the problem of supplying the population with high-quality healthy food products.