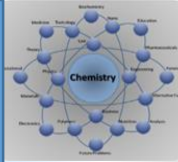
Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY Ukraine



Scientific and Technical Projects by SERGIY KURTA-

Member of the Academy of Technological Sciences of Ukraine, Doctor of Technical Sciences, Professor

I. Chemical technology for the synthesis of organic products and polymers.

1.1.Industrial technology polymerization of vinyl chloride on the surface of dispersed oxides and to produce new polyvinylchloride composite materials.

1.2.Ecological technologies of the industrial synthesis of 1,2-dichloroethane, vinyl chloride and polyvinylchloride.

11. Technology and equipment for processing utilization and recycling of industrial and household waste

2.1.Technology and equipment for the grinding, separation and recycling of waste-paper-containing polymer.

2.2.Environmentally friendly industry technologies separation and recycling of highly toxic organochlorine wastes.

III. Technologies for production and processing of ecological organic food products

3.1. Biopolymer compositions for the agrochemical environmentally friendly technology of pre-processing the seeds of the agricultural crops with a minimum of fertilizers used.

3.2.Improving the technology of synthesis of biodiesel from absolutized bioethanol.

3.3.Express method for dissolution of crystalized bee honey and its stabilization in liquid condition with long term storage.

3.4.Chewing gum based on natural honey, wax, and bee-glue for the prevention and treatment of periodontal diseases.

3.5. Extraction of the aromatic substances from coffee and their effect on the metabolism of alcohol.

IV. Chemical technologies of building thermal insulation materials

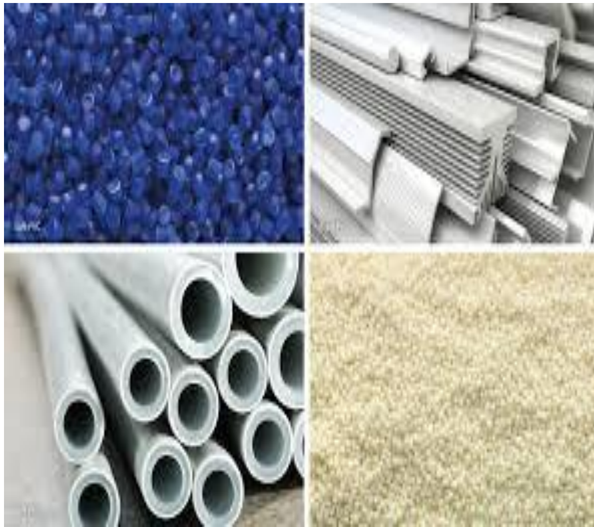
4.1. Improvement of the production of thermal insulation foam on the basis of the urea formaldehyde resins.

4.2.Thermal insulation materials based on crushed and separated waste paper.

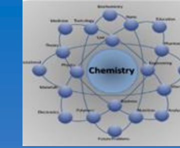
1.Chemical technology for the synthesis of organic products and polymers:

1.1. Industrial technology of polymerization of vinyl chloride on the surface of dispersed oxides and to produce new polyvinylchloride composite materials.

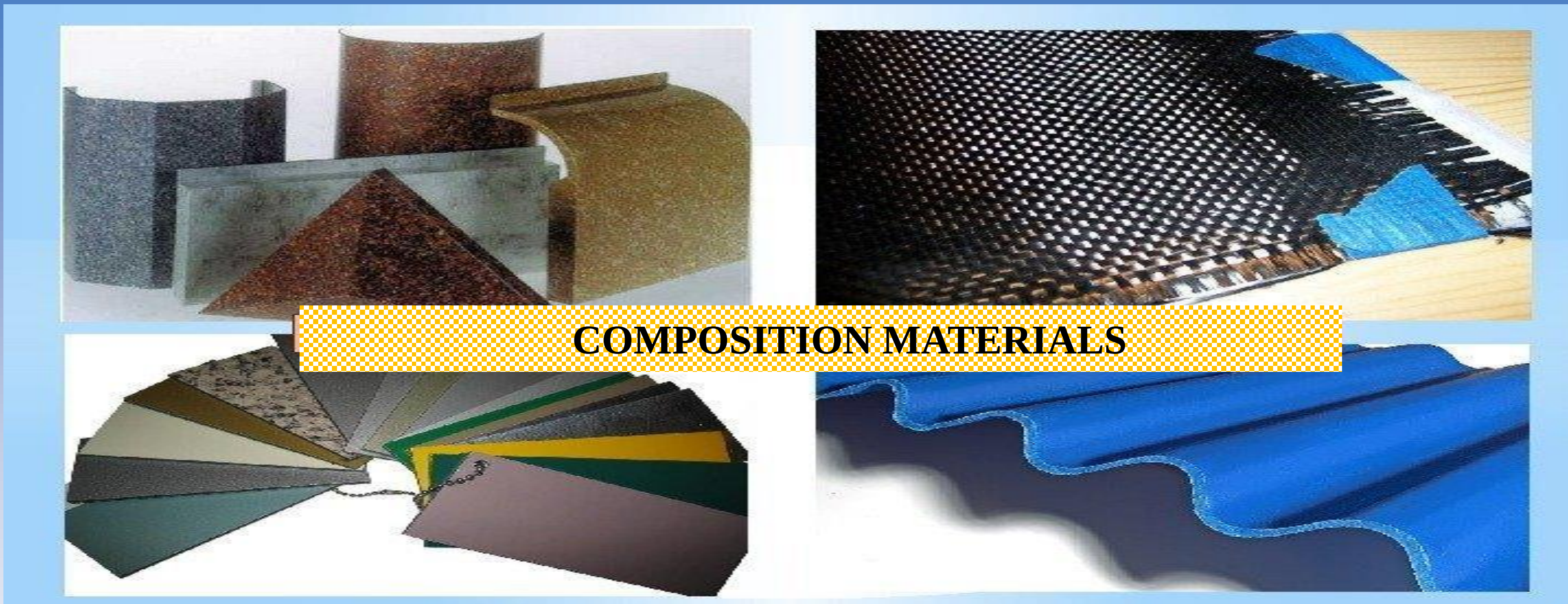
1.2.Ecological technologies of the industrial synthesis of 1,2-dichloroethane, vinyl chloride and polyvinylchloride.



Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY Ukraine
Sergiy Kurta - Doctor of Technical Sciences, Professor (+380509685163, kca2014@ukr.net)

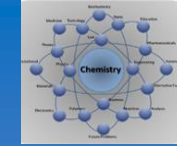


1.1. INDUSTRIAL TECHNOLOGY POLYMERIZATION OF VINYL CHLORIDE ON THE SURFACE OF DISPERSED OXIDES AND TO PRODUCE NEW POLYVINYLCHLORIDE COMPOSITE MATERIALS.



1. The technology of industrial methods of emulsion and gas-phase polymerization of vinyl chloride on the surface of unmodified and modified pyrogenic highly dispersed oxides - silica (SiO2), alumina (Al2O3) and rutile (TiO2) - has been developed.
2. Obtained by polymerization filling, PVC emulsion was used as a component of PVC by plasticized organosols and plastisols, which had a stable low viscosity during long-term storage, transportation and processing into PVC composite products.
3. As a result of the gas-phase polymerization of vinyl chloride on the surface of fine silica, special fine fillers with adjustable particle sizes were obtained, which were used for the coating of synthetic and artificial leather, giving it light-scattering properties.

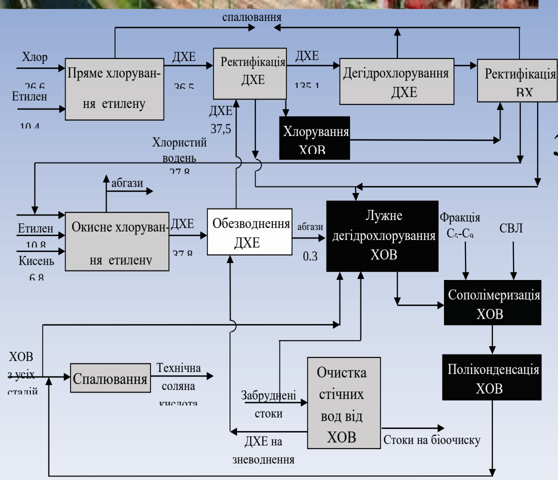
Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY Ukraine
Sergiy Kurta - Doctor of Technical Sciences, Professor (+380509685163, kca2014@ukr.net)



1.2.Ecological technologies of the industrial synthesis of 1,2-dichloroethane, vinyl chloride and polyvinylchloride.

Based on the increase in vinyl chloride, 1,2-dichloroethane and PVC production in Ukraine and around the world, the amount of highly toxic organochlorine waste that is incinerated has increased to 5-10%. Emissions from the combustion of organochlorine wastes are environmentally hazardous due to the formation of hydrogen chloride, chlorine, and dioxins during the combustion process. We propose to improve all 5 stages of industrial vinyl chloride synthesis technology and to reduce at the 10 times the amount of organochlorine wastes, that are incinerated , by recycling them into monomers and polymers for industrial reuse. The projected economic impact from the savings of raw materials - ethylene, chlorine, gas, which will not be incinerated with organochlorine waste, can amount to about $ 20 million per year at one Karpatnaftochim plant in Kalush Ukraine. According to the block diagram in Fig. 1 industrial process for the balanced synthesis of vinyl chloride consists of eight main technological stages:

1.The process of the reaction of oxychlorination of ethylene in 1,2-Dichlorethan : $C_2H_4 + 2HCl + 0.5O_2 \rightarrow C_2H_4Cl_2 + H_2O + Q$ Apart from this, according the following processes occur with the participation of copper catalysts: $2CuCl_2 + C_2H_4 \rightarrow C_2H_4Cl_2 + 2CuCl$/ 2.$2CuCl + O_2 \rightarrow 2CuCl_2$ + I



2.Direct additive chlorination of ethylene to 1,2-dichloroethane in the presence of FeCl3 catalyst promoted by NaCl: $CH_2{=}CH_2 + CI_2 + FeCI_3 \rightarrow CICH_2\text{-}CH_2^+ + FeCI_4^- \rightarrow CICH_2CH_2CI$+FeC

3)Термal dehidroclorination 1,2-DCE to VC monomer: $CH_2Cl - CH_2Cl \xrightarrow{500^0} CH_2 = CH - Cl$

4) Rectification of dichloroethane and vinyl chloride monomer; 5) Combustion of organochlorine wastes -COW; 6) Sewage treatment; 7) Dehydration of 1,2-DHE.

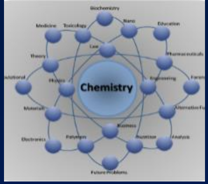
Seven of the eight stages of this process have been studied and improved, and four new stages have been introduced: 1) COW chlorination; 2) alkaline dehydro-chlorination of COW; 3) COW copolymerization with an unsaturated olefin production C5-C9 fraction; 4) polycondensation of COW with alkali metal polysulfides and sulfide-containing olefin production wastes.

Expected results of the project

1. **Significant decrease in the amounts and change of composition of the gaseous wastes into atmosphere, which result from the production at synthesis of vinyl chloride and 1,2-dichlorethane and incineration of chlororganic wastes at these plants.**
2. **Decrease in the amount and toxicity of liquid waste from the production of ethylene-propylene due to elimination of sulfides and neutralization of water solutions of alkalis with chlororganic wastes.**
3. **Considerable economy of hydrocarbon raw material, ethylene, and chlorine, which are rare and get more expensive due to the price increase for oil and gas and other energy carriers;**
4. **Mechanisms of catalyst synthesis of 1,2-dichlorethane and vinyl chloride and methods of the compatible processing of chlororganic and sulphide-containing wastes offered by us can be patented in Ukraine and abroad.**

5) Foreseen economic effect from the economy of raw materials (ethylene, chlorine, and gas), which will not be burnt and utilization of sulfur-containing alkali can result in 20 million dollars a year.

Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY
Sergiy Kurta - Doctor of Technical Sciences, Professor
(+380509685163, kca2014@ukr.net)

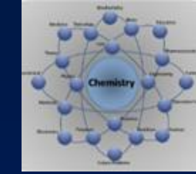


2. Technology and equipment for processing utilization and recycling of industrial and household waste

2.1.Technology and equipment for the grinding, separation and recycling of waste-paper-containing polymer.

2.2.Environmentally friendly industry technologies separation and recycling of highly toxic organochlorine wastes.

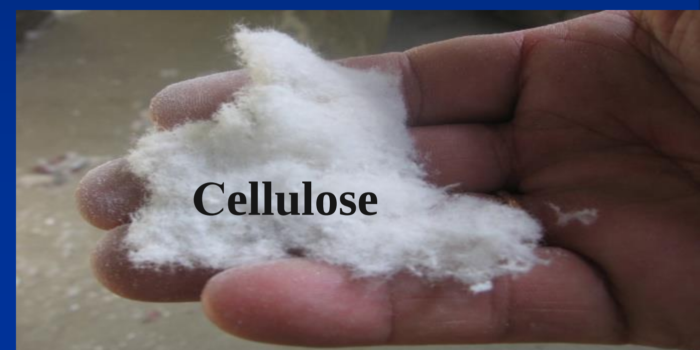
Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY
Sergiy Kurta - Doctor of Technical Sciences, Professor (+380509685163, kca2014@ukr.net)



2.1. Technology and Equipment for the Grinding , Separation and Recycling of Waste-Paper-Containing Polymer

We have developed and created industrial technology and equipment for grinding, separation, utilization, and recycling of 95% of paper waste, including wallpaper with polymer coating and packaging waste type TETRAPAK. The technology of separation and processing of paper waste with a polymer coating includes the first stage of grinding paper waste with a polymer coating on a crusher of the disk-type. The second stage of grinding includes using a drum crusher, with the separation of the cellulose fiber base (paper) from the polymer coating. In the third stage, the separation of 2 fractions - polymeric coating and cellulose fibrous base - paper, is carried out in the air stream, using a newly designed separator, cyclone, and fabric filter.

As a result of this process, 50%-95% of pure cellulose and 50-5% of polymeric waste can be obtained from paper-coated paper waste. In this case, cellulose can be used to re-obtain technical paper, packaging cardboard, and flizelin. The obtained secondary cellulose can be used as a heat-insulating material, structural filler for the production of asbestos-free slate, for the production of fuel briquettes and pallets, and the construction and polymer composite materials.



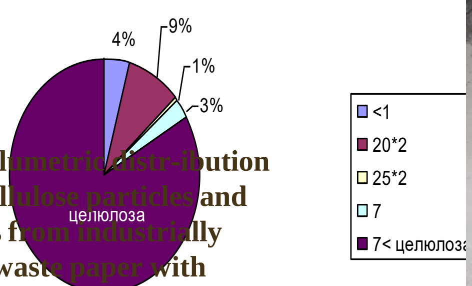
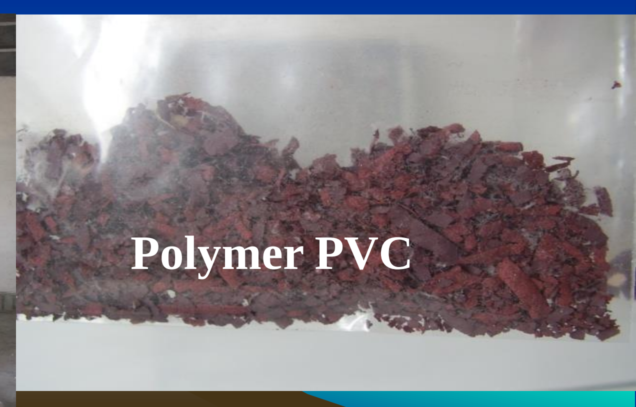
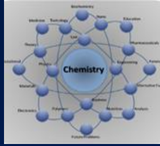


Fig 1. Volumetric distr-ibution (%) of cellulose particles and polymers from industrially crushed waste paper with polymers on a universal three-stage crusher in size



Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY Ukraine
Sergiy Kurta - Doctor of Technical Sciences, Professor (+380509685163, kca2014@ukr.net)



2.2.Environmentally friendly industry technologies separation and recycling of highly toxic organochlorine wastes

Based on the increase in vinyl chloride, 1,2-dichloroethane and PVC production in Ukraine and around the world, the amount of highly toxic organochlorine waste that is incinerated has increased to 5-10%. Emissions from the combustion of organochlorine wastes are environmentally hazardous due to the formation of hydrogen chloride, chlorine, and dioxins during the combustion process. We propose to improve all 5 stages of industrial vinyl chloride synthesis technology and to reduce at the 10 times the amount of organochlorine wastes, that are incinerated , by recycling them into monomers and polymers for industrial reuse. The projected economic impact from the savings of raw materials - ethylene, chlorine, gas, which will not be incinerated with organochlorine waste, can amount to about $ 20 million per year at one Karpatnaftochim plant in Kalush Ukraine.

The name of the organochlorine components waste, Karpatnaftokhim, Kalush	Contents % mass.	Class dangers	Limit admissible. conc. mg / m3
1.1. Vinyl chloride	0,0003	1	1
2.2. Allyl chloride	0,0039	1	0,3
3.3.Trans-1,2-dichloroethylene	0,0009	2	20
4.4. Carbon tetrachloride	0,0215	2	15
5.5.Benzene	0,01	2	20
6.6. Chloroform	0,0134	2	10
7.7.1,1,2-trichloroethylene	0,019	2	10
8.8.1,2-DHE	16,4	2	10
9.9. Perchlorethylene	0,418	2	20
10.10.1,1,2-trichloroethane	36,61	2	5
11.11.1,1,2,2-tetrachloroethane	2,034	1	0,5
12.12.Ethylene chloride (ECG	0,444	2	10
13.14. Their (not identified by VOCs)	43,865	1	0,001
14.15.1,2,3,4,6,7,8,9-octachloro dioxin	0,001		

CHEMICAL REACTIONS

Recycling and disposal organochlorine waste production

1. Chlorination of the chloridwaster

$$CH_2=CHCl+Cl_2 \rightarrow CH_2Cl-CHCl_2$$

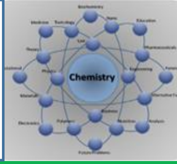
2. Alkaline dehydrochlorination of waste

$$2CH_2Cl-CHCl_2+Ca(OH)_2 \rightarrow 2CH_2=CCl_2+CaCl_2+2H_2O$$

3.Polycondensation of organochlorine and sulfide-containing wastes of recycling of organochlorine wastes processing

$$Cl-CH_2-CH_2-Cl+NaS_4Na \xrightarrow{80-90^0C} Cl-CH_2-CH_2-S_4-Na+NaCl$$

: 1. Reduction of quantity and composition of emissions at incineration to 10 times less of organochlorine wastes at factories for vinyl chloride production.
2. Reduction of toxicity of liquid effluents from the production of ethylene-propylene at petrochemical enterprises.
3. Significant savings in hydrocarbons, ethylene, chlorine and energy, which are becoming more expensive.
4. Improvement of technology for catalytic synthesis of vinyl chloride and methods of utilization and recycling of organochlorine and sulfide wastes.
5. The projected economic effect only on the savings of raw materials - ethylene, chlorine, natural gas, which are now incinerated in organochlorine and sulfur-containing wastes, is about $ 20 million a year.
6. Improvement of the ecological situation in the regions of Ukraine and abroad, where organochlorine waste is burned, and the reduction of carbon monoxide and carbon dioxide, dioxins, hydrogen chloride and organochlorine compounds, which cause destruction of the Earth's



III. Technologies for production and processing of ecological organic food products

3.1. Biopolymer compositions for the agrochemical environmentally friendly technology of pre-processing the seeds of the agricultural crops with a minimum of fertilizers used.

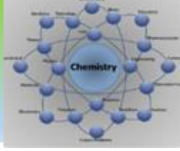
3.2. Improving the technology of synthesis of biodiesel from absolutized bioethanol.

3.3. Express method for dissolution of crystalized bee honey and its stabilization in liquid condition with long term storage.

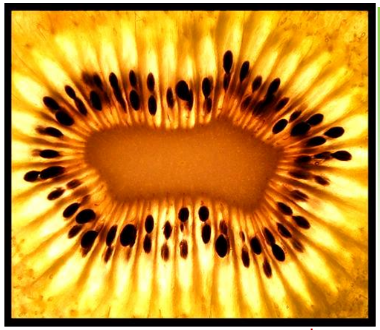
3.4. Chewing gum based on natural honey, wax, and bee-glue for the prevention and treatment of periodontal diseases.

3.5. Extraction of the aromatic substances from coffee and their effect on the metabolism of alcohol.

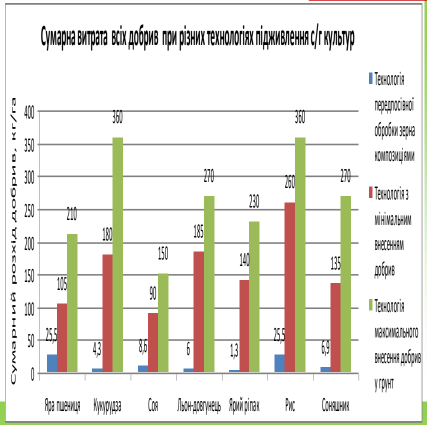
Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY
Sergiy Kurta - Doctor of Technical Sciences, Professor (+380509685163, kca2014@ukr.net)



3.1. Biopolymer Compositions for the Agrochemical Environmentally Friendly Technology of Pre-Processing the Seeds of the Agricultural Crops with a Minimum of Fertilizers Used



The system of preparatory farm work provides high-effect pre-plant seed treatment by biopolymer film-forming compositions, containing polymer water solution, fertilizers, minerals, and other biologically active substances. These techniques carry significant impact on the behavior of the seed at sowing, growth, and their productivity in different agro-ecological conditions. In contrast to other methods of seed treatment, our proposed method is based on the use of only naturally occurring biopolymers in aqueous film forming compositions with mineral fertilizers, cavitationally-treated water, and micronutrients.



Implementation of this method will result in the following:

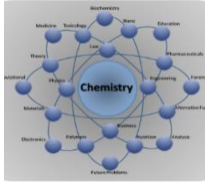
1.Decontamination of seeds from pathogens of plants;
2.Protection of plants and germs from mold and fungi during germination;
3.Reducing the negative impact of mechanical injury on the seeds ;.
4.Protecting grain from pests on the fields;
5.Promoting plant growth in the initial period of their development
6.Partial increase of crop yields;
7.Selectivity of seeds of a new crop.

Photo: Rice varieties. "August" Botanical Garden, Ivano-Frankivsk, Ukraine

Implementation of this project will bring solutions to many problems in Ukraine and abroad:

1.Provide the population of Ukraine and other countries with inexpensive, environmentally-friendly non-genetically modified agricultural and food products;
2.Reduce the needs of agriculture in mineral fertilizers and micronutrients for all kinds of plants up to 10 times;
3.Reduce pollution of the fertile soil with fertilizers and micronutrients, reduce the burden on the environment and especially on agricultural land, and reduce pollution of ground waters and, in turn, lakes, rivers, and seas;
4.Reduce dependence on chemical fertilizers and micronutrients, supply shortage of raw materials for their synthesis, address gas and petroleum deficit which is growing all the time;

Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY
Sergiy Kurta - Doctor of Technical Sciences, Professor (+380509685163, kca2014@ukr.net)

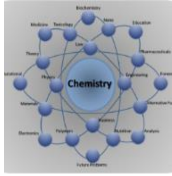


3.2. IMPROVING THE TECHNOLOGY OF SYNTHESIS OF BIODIESEL FROM ABSOLUTIZED BIOETHANOL

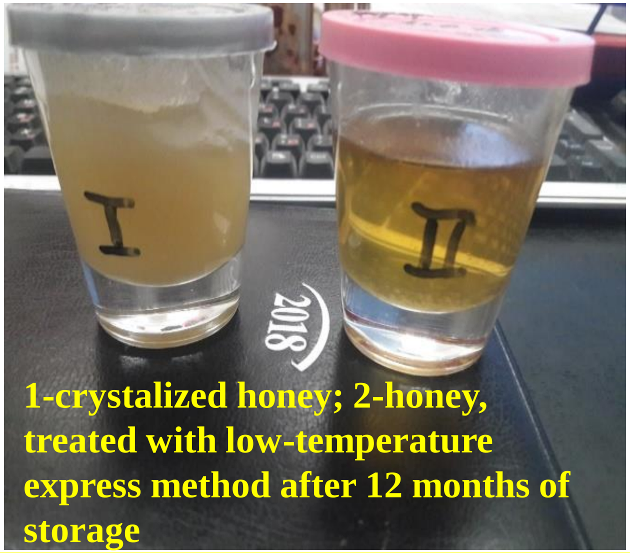
Motor fuel combustion activators (alcohols, ethers, and fatty esters) are widely used as high-octane and high-cetane additives for motor fuels. Such additives as well as bioethanol and biodiesel are produced from natural raw materials. Oxygen-containing compounds have anti-knock, oxygen-generating, washin,g and other beneficial properties. Their application is more environmentally friendly, because it reduces the mono- and carbon dioxide emission, the formation of solid hydrocarbons, soot and reduces the motor fuel consumption. Motor fuel combustion application in chematology can reduce the distribution non-uniformity of gasoline detonation stability by fractions, the tendency to carbonization of fuel and significantly improve the operation and efficiency of the engine. These additives have high octane or cetane number, complete mixing, low volatility, minimal soot formation, and reduced photochemical activity. Their strategic importance in chematology is constantly increasing, since they are obtained from natural materials - corn and vegetable oils and are renewable energy sources.

The aim of this work is the improvement of diesel and gasoline complex dewaxing technology with simultaneous octane and cetane number elevation, development and introduction of effective motor fuel combustion activators based on the improvement of bioethanol dehydratation technology, and the interesterification of natural vegetable oils with increasing of biodiesel yield. Bioethanol dehydration technologies (up to 99.9%) have been improved and simplified. A new technology for the interesterification of natural vegetable oils by absolute ethanol with an increase in the biodiesel yield by 10-15% is proposed.

Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY
Sergiy Kurta - Doctor of Technical Sciences, Professor (+380509685163, kca2014@ukr.net)



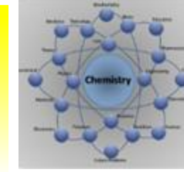
3.3. EXPRESS METHODS FOR DISSOLUTION OF CRYSTALIZED BEE HONEY AND ITS STABILIZATION IN LIQUID CONDITION WITH LONG TERM STORAGE



1-crystalized honey; 2-honey, treated with low-temperature express method after 12 months of storage

1. The possibility of introducing a new industrial technology of a low-temperature express method of dissolving crystalized honey and stabilizing its liquid transparent state for at least 1 year has been developed and shown in consumer small containers of 15-500 ml. High diastase and biochemical activity and high consumer organoleptic properties, which meet the requirements of consumers in cafes, restaurants, hotels, and in transport, are preserved.
2. New methods of processing non-crystalized honey and conditions for its sealing for storage and transportation in a liquid state in special, small glass and polymeric containers (15-500 ml) for at least 1 year are proposed.
3. It is possible to create new types and brands of dissolved liquid honey on the basis of different varieties of mono- and poly-floral honey, for single and daily use, with the preservation of consumer properties for at least 1 year.
4. This method and equipment for low-temperature express honey processing can be protected by utility patents. Meanwhile, high diastase number and low values of oxymethylfurfural will be maintained according to the market requirements.
5. I propose this business model, preliminary cost calculations, as well as high profitability and quick payback of the project.

Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY
Dr. Sergiy Kurta, Nadiya Boyko, & Marta Tsap
(+380509685163, kca2014@ukr.net)



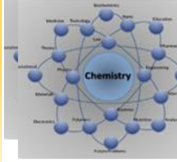
3.4. Chewing Gum Based on Natural Honey, Wax, and Bee-Glue for the Prevention and Treatment of Periodontal Diseases

Periodontal disease are infections of the structures around the teeth that include the gums, periodontal ligament, and alveolar bone. Periodontal disease leads to loss of a tooth or teeth. According to the WHO data, which is based on the research in 53 countries (incl. Ukraine), the highest level of diseases (65-98%) of periodontal tissue (gingivitis, periodontitis and periodontal disease) occurs at the age of 35-44. At the age of 15-19, -80% of children around the world are diagnosed with gingivitis. Generalized periodontitis and paradoxosis in adulthood (45-85 years) are found in 90-95% of patients with periodontal tissues.

We offer a chewing gum made on the basis of caramelized honey, wax, and bee-glue for the prophylaxis and treatment of periodontal disease and other dental diseases. The result is achieved through the use of especially prepared natural, caramelized honey, wax, propolis, and other products of beekeeping into the composition of the chewing gum. The use of chewing gum for every day results in the prevention, protection, and treatment of various dental diseases, especially periodontal disease, in children and adults. In sum, our clinical

Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY
Sergiy Kurta - Doctor of Technical Sciences, Professor (+380509685163, kca2014@ukr.net)

3.5.Extraction of the Aromatic Substances from Coffee and their Effect on the Metabolism of Alcohol



1. A new, alternative method of roasting green coffee with maximum preservation of all coffee aromas and flavors was tested, using special devices for microwave energy, IR radiation. It is possible to reduce the weight loss of coffee beans and energy costs by 15-25% of the coffee cost.
2. A method of distillation of aromatic substances from coffee with water vapor and ethyl alcohol, which can be used to regulate the content of caffeine and enrich the aromas and smells of instant coffee.
3. It is established that the value of the hydrogen indicator of alcoholic coffee extracts approaches the neutral pH values, which distinguishes them from acidic aqueous coffee extracts.
4. The obtained aqueous and alcoholic coffee extracts revealed the presence of aromatic substances of caffeine, and the size of coffee nanoparticles aqueous extracts is much larger than for extracts from ethyl alcohol.
5. New brands of instant coffee with adjustable content of caffeine and aromatic substances enriched with coffee flavors and caffeine from natural coffee extracts.
6. The production of low-alcoholic beverages with coffee extracts was tested and acceleration of metabolism of alcohol conversion in the human body was established.

Fig. 1. The dependence of the percentage content of fractions of coffee extract particles on the particle size (nm).

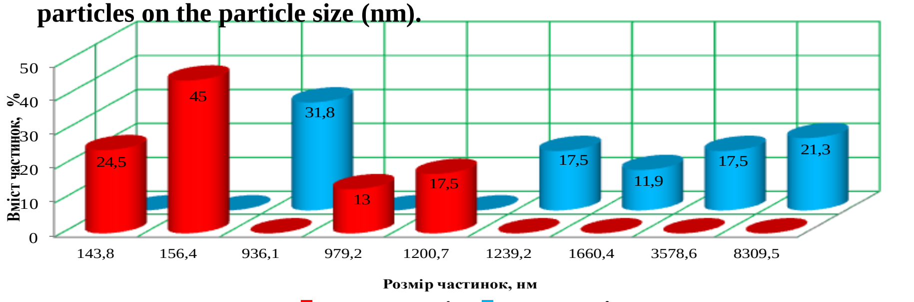
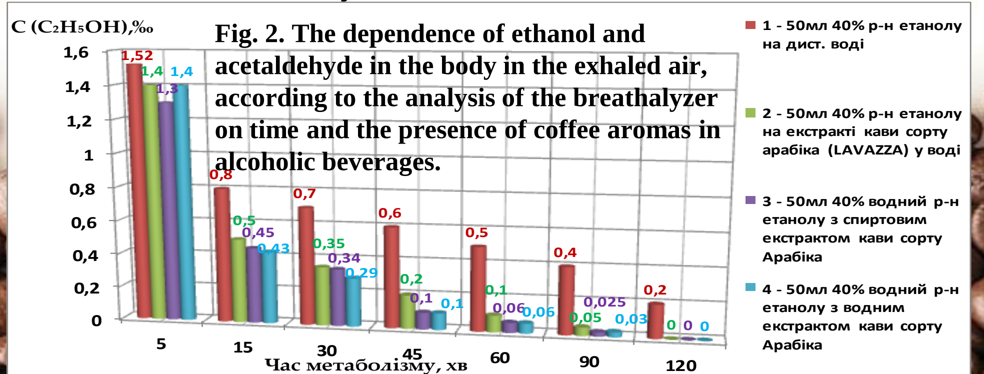
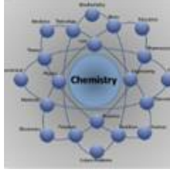


Fig. 2. The dependence of ethanol and acetaldehyde in the body in the exhaled air, according to the analysis of the breathalyzer on time and the presence of coffee aromas in alcoholic beverages.





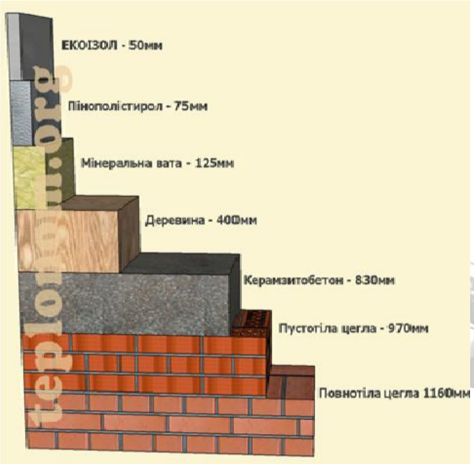
Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY

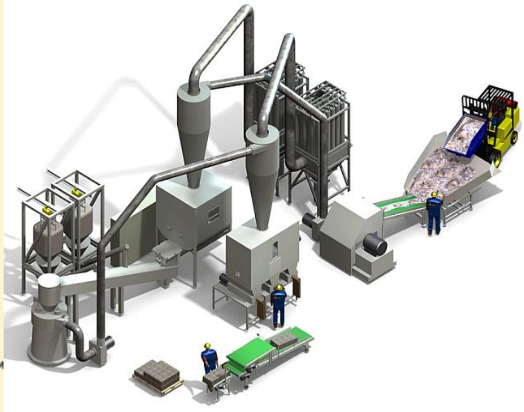
Sergiy Kurta - Doctor of Technical Sciences, Professor (+380509685163, kca2014@ukr.net)

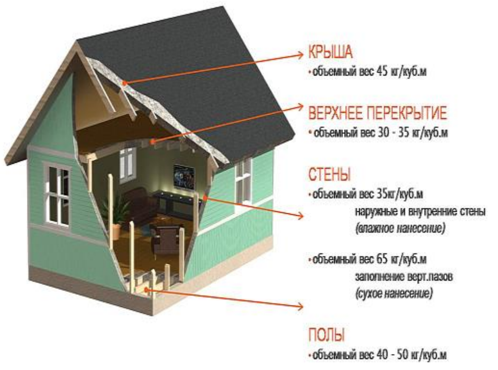
IV. Chemical technologies of building thermal insulation materials

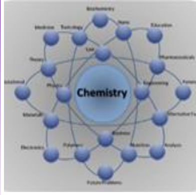
4.1. Improvement of the production of thermal insulation foam on the basis of the urea formaldehyde resins.

4.2.Thermal insulation materials based on crushed and separated waste paper.









Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY
Sergiy Kurta - Doctor of Technical Sciences, Professor (kca2014@ukr.net)

4.1. Improvement of Production of Thermal Insulation Foam on the Basis of the Urea Formaldehyde Resins

Fig 1.The dependence of the concentration of CH2O in the air of the working area on the composition of the formulation UF foam

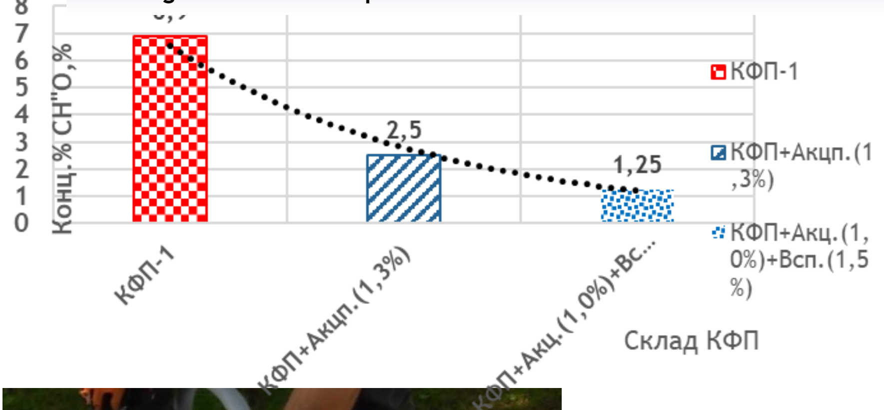


Fig.2. Dependence of the density of UF foam on its composition

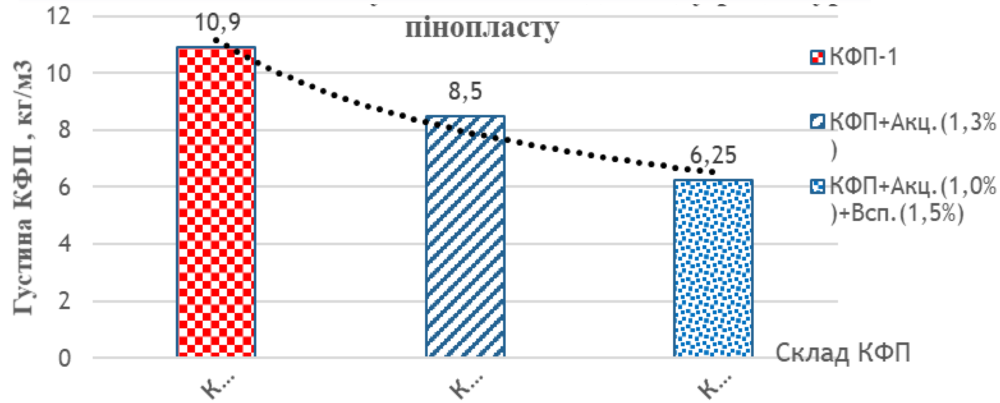
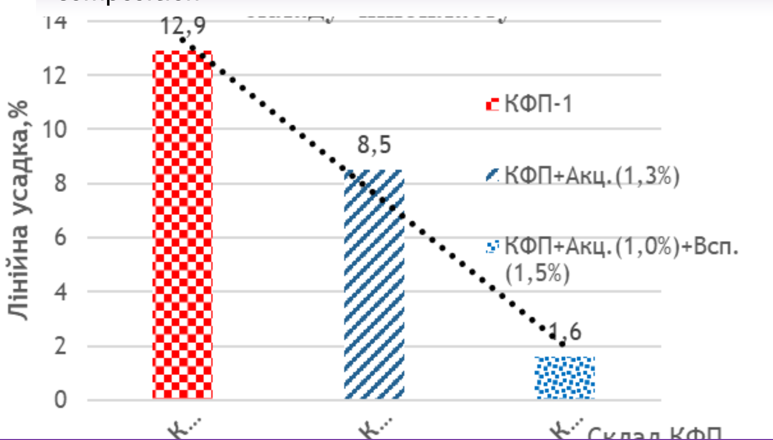
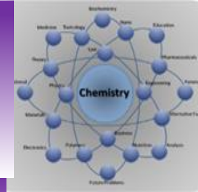


Fig.3.Dependence of linear shrinkage of UF foam on its composition



1. **To reduce the toxicity, when foaming urea-formaldehyde (UF) resin, it was proposed to additionally introduce 0.5%-1% of the acceptor gaseous formaldehyde, released during the injection of UF foam. The concentration of formaldehyde in the working area is reduced by 3 times and does not exceed the maximum permissible concentration = 5mg / m3 (Fig. 1).**
2. **In order to reduce the linear and three-dimensional shrinkage (reduction in size) of the obtained UF foam after drying, it was proposed to introduce an additional chemical foam in the UF resin in the amount of 1%-1.5%, which made it possible to reduce the shrinkage of dry foam from 12% to 1.6% and to stabilize the foam size during operation (Fig. 3).**
3. **As a result of changes in the formulation of UF foam when foaming with UF resin, due to the introduction of formaldehyde accepter and additional**

Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY
Sergiy Kurta - Doctor of Technical Sciences, Professor (+380509685163, kca2014@ukr.net)



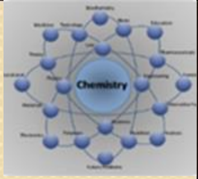
4.2.Thermal insulation materials based on crushed and separated waste paper

1.For example, at 5 enterprises for the production of wallpapers with polymers in Ukraine, including Sintra Ltd in Kalush, Ivano-Frankivsk oblast, produce up to 100 million wallpaper rolls per year. 5-10% of this product falls into waste. The total amount of waste in Ukraine exceeds 5-10 million rolls a year, and there is a shortage - inappropriate color or quality wallpapers. Thus, the grinding and separation of these wastes according to our technology will give an opportunity to get 2-5 million tons of secondary polymers (PE, PVC) and 5-8 million tons of recycled paper, waste paper, cellulose

2.To date, we have created and own technology and equipment for the separation, utilization and recycling of waste paper scrap containing from 10% to 50% of PVC polymers. But we want to improve this equipment and technology for the separation, utilization and recycling of TETRA PACK paper and packaging waste.

3.We plan to design an efficient, environmentally friendly technology and industrial equipment-mill and separator for dry separation of the paper from polymer type TETRAPAK, for mechanical separation and recycling of containing polymer waste paper that will support new consumer standards within the framework of social issues, creating new jobs, competitiveness, and principles of sustainable development

Department of Chemistry VASYL STEFANYK PRECARPATHIAN NATIONAL UNIVERSITY UkraineScientific and Technical Projects



Our Research Team

Sergiy Kurta – Doctor of Technical Sciences, Professor at the Department of Chemistry, Faculty of Natural Sciences, Vasyl Stefanyk Precarpathian National University (phone: +38 0509685163; 0342596168; email: kca2014@ukr.net)

Nadia Kurta – chemical engineer-technologist Department of Chemistry, Faculty of Natural Sciences, Vasyl Stefanyk Precarpathian National University

Sofia Fedorshenko - PhD, Associate Professor at the Department of Chemistry, Faculty of Natural Sciences, Vasyl Stefanyk Precarpathian National University Ivano-Frankivsk, Ukraine

Mikitin Igor- PhD, Associate Professor at the Department of Chemistry, Faculty of Natural Sciences, Vasyl Stefanyk Precarpathian National University Ivano-Frankivsk, Ukraine

Olga Khatsevich- PhD, Associate Professor at the Department of Chemistry, Faculty of Natural Sciences, Vasyl Stefanyk Precarpathian National University Ivano-Frankivsk, Ukraine