PROPOSALS FOR GOOPERATION OF DEPARTMENT OF CHEMICAL ENGINEERING AND INDUSTRIAL ECOLOGY OF NTU “KHPI”

DEPARTMENT OF CHEMICAL ENGINEERING AND INDUSTRIAL ECOLOGY

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Our specialties at:

Bachelor's level

- Natural sciences. Ecology, Environmental Protection and Conservation of Nature
- Machine building

Master's level

~Ecology and Environmental Protection

~Equipment for Chemical Industry and Construction Material Production

~Equipment for Processing and Food Industry

THE MOST SIGNIFICANT RESULTS OF THE DEPARTMENT IN THE SCIENTIFIC ACTIVITY

Themes of research works:

1. ORGANIC WASTE RECYCLING BY LOW-TEMPERATURE PYROLYSIS WITH SUBSEQUENT OBTAINING OF ELECTRICITY AND HEAT
2. POSSIBILITY ORGANIZATION OF MASS PRODUCTION FILAMENTARY CRYSTALS REFRACTORY INORGANIC COMPOUNDS BY CRYSTALLIZATION FROM THE MELT-SOLUTION ON THE BASIS OF HALIDES OF ALKALI METALS
3. PARAMETERS CONTROL OF MAGNETIC LIQUID BY EDDY CURRENT METHOD

ORGANIC WASTE RECYCLING BY LOW-TEMPERATURE PYROLYSIS WITH SUBSEQUENT OBTAINING OF ELECTRICITY AND HEAT (prof. V. Shaporev)

Aim of the work: designing of technology and equipment for pyrolysis of organic household waste (OHW) and alternative fuels producing: combustible gas, semi coke, hydrocarbon resins.

Scientific novelty

making a thermodynamic and kinetic analysis of the OHW pyrolysis process for establishing the mechanism of chemical reactions, as well as rational temperature mode

Practical application

creation of hardware and technological scheme of organic waste recycling to produce products that can be used as alternative fuels or be a materials for further deeper processing

References

1. V. Shaporev, V. Mikhailik, V. Sebko (2010) About the possibility of organic solid waste processing by pyrolysis. Eastern-European Journal of Enterprise Technologies. 6/6 (48), 27-32.
2. V. Shaporev, V. Mikhailik, V. Sebko (2011) Schematic diagram of the pyrolysis reactor plant for municipal solid waste in moving layer and experimentally established peculiarities of the process. Integrated Technologies and Energy Conservation. 2, 45-54.
3. V. Mikhailik, V. Sebko, V. Shaporev (2011) One of the possible reactor designs for the high-temperature pyrolysis process implementation for organic waste and reactor scheme based on it. 12, 138-145.

ABOUT POSSIBILITY ORGANIZATION OF MASS PRODUCTION FILAMENTARY CRYSTALS REFRACTORY INORGANIC COMPOUNDS BY CRYSTALLIZATION FROM THE MELT-SOLUTION ON THE BASIS OF HALIDES OF ALKALI METALS (I. Pitak, PhD)

The objective: To simplify the process growing and isolating filamentary crystals; the creation of the streamed process and increase productivity of the reactor facility; increase in the yield of homogeneous crystals by geometric size and reduce the amount of substandard products; improvement crystals strength; decrease in the volume of wastewater.

The planned results: Create filamentary crystals of refractory compounds which are one of the more perspective kinds of reinforcing fillers for creation super strong and heat resisting composite materials on the metal, polymer and ceramic-based.

The scientific novelty: To develop a process; create the design of the reactor continuous action and the streamed technology system of process production filamentary crystals

The practical significance: The increase process performance growing the filamentary crystals up to 200 kg per year, with one furnace.

References

1. V. Shaporev, I. Pitak, O. Shestopalov (2014). Technology laws the formation and growth filamentary crystals inorganic compounds from solution-melt. “Eastern-European journal of enterprise technologies” 4/6(70), 35-43.
2. V. Shaporev, I. Pitak, O. Shestopalov (2015). About possibility of recrystallization of dispersible rutile in threadlike crystals in fusion of halide of alkaline metals. Scientific Journal “Science Rise” 1/2(6), 10−16.
3. V. Shaporev, I. Pitak, O. Shestopalov (2016). Organization of mass production of filamentary crystals of refractory inorganic compounds by crystallization from the melt-solution on the basis of alkali metal halides. “Integrated technologies and energy saving”, 1, 47-59.

ABOUT POSSIBILITY ORGANIZATION OF MASS PRODUCTION FILAMENTARY CRYSTALS REFRACTORY INORGANIC COMPOUNDS BY CRYSTALLIZATION FROM THE MELT-SOLUTION ON THE BASIS OF HALIDES OF ALKALI METALS

Filamentary crystals of refractory compounds are one of the more perspective kinds of reinforcing fillers for creation super strong and heat resisting composite materials on the metal, polymer and ceramic-based.

Filamentary crystals and compositions on them based are widely used as heat insulation and flame retardants, as well as materials for protection from infrared and laser radiation.

Why?

Unique high strength which inherent in all filamentary crystals and which related to the high perfection of their structure and surface.

The high energy of the interatomic bond, which is characteristic of refractory compounds, determines majority of the rest of the most valuable properties of crystals of these compounds, by using their as a reinforcing filler.

Which are refractory compounds?

geksatity of potassium

oxides of titanium

oxides of magnesium

oxides of aluminum

oxides of silicon carbides

other compound

PARAMETERS CONTROL OF MAGNETIC LIQUID BY EDDY CURRENT METHOD
(Prof. Sebko V.)

Aim of the work **to create a non-contact eddy current method of four-parametres coaction determination for relative magnetic permeability $\mu f.l.$, electrical resistivity ρ, the effective radius of the sample a and temperature t ferromagnetic liquid of wide range (when $1.2 \leq \mu f.l. \leq 250$) based on heat transformer's eddy current probe (TECP).**

Future results

to get new universal function for converting thermal TECP with controlled samples of ferromagnetic liquid (if $1.2 \leq \mu f.l. \leq 250$)

to bring basic relations describing four-parametres eddy current method for coaction determining of relative magnetic, electric, geometric and thermal parameters of different ferromagnetic liquids

to develop an algorithm for coaction determination μ,ρ,a,t based on heat TECP

A scientific novelty

to receive universal conversion functions that enable the measurement control four-parameters ferromagnetic liquids (when $1.2 \leq \mu f.l. \leq 250$) .

Practical application

new method of coaction determination μ,ρ,a,t based on heat TECP can be used for quality evaluation of ferromagnetic liquids during their manufacture, storage and operation

References

1. V.Sebko, A.Verba (2011) Contactless integrated multi-parameter eddy current testing of samples weakly ferromagnetic and ferromagnetic liquid media.1, 53-57.
2. V. Sebko (2011) Determination of the four parameters of the sample controlled magnetic fluid with a heat transformer
3. eddy current transducer, 48, 140 - 150.