

## Complex Problems of Power Systems Based on Renewable Energy Sources

TKALENKO D., KUDRYA S., TKALENKO M., VYSHNEVSKA Y., BUD'KO V. (Kyiv). **About electrodes corrosion stability of electrochemical energy converters with fused electrolyte.**

Based on test data and worked out theoretical presentation about electrode processes in high-temperature electrochemical systems the nature of abnormal cathode metal dissolution in acid containing fluxes has been exposed, the mechanism of the same process has been substantiated. The fluxes are used as electrolytes. Parameter dependency of the above process over electrolyte cation content, ionic flux dehydration level, potential and electrode material have been determined and interpreted. There have been grounded the parameters influencing corrosion demolition speed of electrode materials in electrochemical sources of electricity. The approaches ensuring and providing corrosion resistance increasing and electrodes service life have been suggested. Ionic fluxes have been chosen as current source.

## Solar Energy

BEKIROV E., VOSKRESENSKAYA S. (Simferopol). **Developing grapho-analytical models of concentrated solar power plants with double PV cells for energy generation.**

There have been presented a grapho-analytical model of a concentrated solar power plant that direct solar radiation over double PV cells. The last are used as receivers. Besides the formulae for models calculation and analysis have been presented.

MUSIY R., SEMENYUK I., GALCHAK V., SYROTYUK S. (L'VIV), KHAIRNASOV S. (Kyiv). **Developing and studying domestic effective coating for absorbing surfaces of solar collectors.**

The article considers a new approach to obtain effective coating for perceptible surface of the solar collector via sol-gel method technology. Presented results of two independent investigations carried out both under illumination by natural solar radiation and with the use of a measuring stand with solar spectrum simulator showed that the efficiency of a developed coating isn't worse than well-known selective coating developed by SunSelect firm (Germany).

GARASHCHUK V., LUKASHENKO A., SYDORETS V. (Kyiv). **Evaporation of thin layers on top of solar panels by means of lazer.**

There has been studied the process of thin silicon layers as well as electro-conductive Indium Tin Oxide layers evaporation for the purpose of development laser technology development. This laser technology should split large areas of evaporated layers into separate elements for further solar panels production. There has been validated the need to use eximer xenon chloride (XeCl) lasers for precision treatment of such thin layers. Laser has to operate in pulse mode with pulse duration 30..40ns, power in pulse – 107..108W, repetition frequency – 100...300Hz.

DEMCHENKO V. (Kyiv). **Experimental studies of heat-mass-transfer process in air solar systems.**

The article considers heat exchange peculiarities in air solar systems that should be taken into account when working out technical solutions to improve thermal protection of zero-energy buildings. Experimental results have proved the right choice to use solar energy to compensate heat losses via building protecting designs. There have been suggested new ways to obtain thermal energy with the help of solar convectors and ventilated front solar panels.

## Wind Energy

KUZNETSOV M. (Kyiv). **Stochastic models of a power system performance that contains wind farms.**

Power systems performance is accompanied by a number of random factors related to current power consumption, equipment failures and power generating facilities cutouts. The presence of wind farms within power system framework leads to additional uncertainty. A mathematical model based on stochastic differential equations can predict the parameters of power system uncertainty. Analytical approaches can be applied for further model research. The use of Monte Carlo methods to simulate stochastic processes is illustrated within the North Pool study by KTH (Stockholm).

## Hydroenergy

VAS'KO P., BRYL' A., MOROZ A. (Kyiv). **Determining hydropotential of small rivers provided random water consumption.**

There have been developed theoretical bases to estimate hydro and power potential of small rivers in case of various water yield. To determine stochastic yield a Krytskyi-Menkel three-parameter gamma distribution has been applied. A vertical river profile has been built on the base of the Earth surface space probing results.

## Geothermal Energy

REZAKOVA T. (Kyiv). **Heat exchange and fluid spread dynamics in the porous layer.**

The processes of heat transfer and filtration in an underground permeable collector have been simulated when liquid is being pumped in. There have been obtained time dependences of temperature front advancement and promotion of the pumped in fluid in the gas-saturated aquifer. There also have been estimated indexes of geothermal cogeneration power plant operation working on gas-saturated geothermal water.

## BIOENERGY

MATVIICHUK O. (Kyiv), RUDAVINA O. (Lugansk), CHERNYAVSKYI M. (Kyiv). **Experimental studies of physical, chemical and thermo technical properties of straw and shells as solid biofuel.**

There has been presented a review of agricultural waste biomass fuel potential in Ukraine. There have been classified basic physical, chemical and thermal properties of the most widespread types of fuel biomass. There have been explored those properties that require more advanced study of biomass for further development of demands to it as to energy source and when installing boilers. The standards of test treatment, technical, element, calorimeter and other analysis of biomass and coal have been correlated. The tasks of fuel biomass complex study have been determined, the first study results have been presented.

SHCHURSKA K., KUZMINSKYI E. (Kyiv). **Bio-electrochemical hydrogen generation in microbial fuel cell. 3. Experimental part.**

Renewable energy effectively solves the major problems that occur during using traditional fuels, namely, lack of energy resources, energy dependency and environmental pollution. Resource base for hydrogen production is inexhaustible; it can be produced from water, biomass and wastes. Modern technologies for hydrogen production are expensive and require fossils as a source of hydrogen (except water electrolysis). Therefore, the most promising area of hydrogen production is development of biotechnology using biological

objects and especially in microbial fuel cell (MFC). The goal of this study is to determine optimal parameters for hydrogen production in MFC using microbial associations selected from the activated sludge of Bortnytska aeration station.

BUD'KO M., VASYL'KEYVYCH O. (Kyiv). **Test results analysis of both catalyst concentration and temperature influence over transesterification reaction time-period. Transesterification reaction is made out of plant oils by means of methyl alcohol.**

The article presents tests results of plant oil transesterification by methyl alcohol when changing catalyst concentration and temperature. There have been defined temperature ratio and energy activation in transesterification

reaction. It has been determined that reaction mechanism within KOH (potassium hydroxide) presence is actually the result of several physical and chemical processes layout.

ZASYAD'KO Y, MIROSHNYK M, DUNAEVSKA N., ZASYAD'KO P. (Kyiv). **Modeling the process of biomass dehydration base on thermogravimetric analysis (TGA).**

A kinetic model has been built to dry various biomass. The mathematical model describes kinetics of moisture removal when heating up the sample with permanent speed. There have been presented estimated kinetic parameters being obtained due to thermogravimetric analysis.

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