UTILIZATION OF CARBON DIOXIDE BY GROWING INDUSTRIAL MICROALGAE IN POWER BASED FUEL CELLS

A. Palchik

N. Burega

O. Fendo

A block diagram of the energy system based fotoanaereobnyh biotechnology and solid oxide fuel cell.

Biotechnology, fotobioreaktor, microalgae, system, solid oxide fuel cell.

Fuel and energy resources every year becomes more expensive for both the industry and to the public. The living standards of humanity dictates the feasibility of increasing power capacity is extremely fast, and environmental problems caused by interference technogenesis and excessive emissions bowels of the planet, forcing more economically and efficiently use energy generation. The need to generate a large number of electrical, thermal or mechanical energy in a variety of power systems is accompanied by an excessive amount of carbon dioxide that violates material and energy balance of the planet.

One promising avenue that is currently developed is the use of microorganisms in the energy complex to generate biogas, biodiesel and hydrogen. The life cycle of microorganisms is accompanied by photosynthesis, which allows to absorb carbon dioxide and generate oxygen.

The purpose of research - analysis methods of waste carbon dioxide from the atmosphere and flue gases and justification of the method of growing algae in industrial power system based on fuel cell tverdokosydnoho.

Materials and methods research. Investigation of environmentally friendly energy supply based on the laws of conservation of mass, electrical engineering, electrochemistry and biological processes of photosynthesis.

Results. The beginning of the third millennium coincides with two major crises for humanity: environmental and energy. The massive and unsustainable use

canned types of energy leads to innocent reduction of their stocks and intervention technogenesis - helps release excessive amounts of carbon dioxide emissions, which violates the ecological state of the planet. The solution to these problems, skontsentrovuye increasingly significant scientific and industrial potential of the developed world.

After analyzing the experience of recycling carbon dioxide by absorption-desorption aqueous amine and removing CO2 from flue gases and by 15 heterogeneous catalytic reactions of carbon dioxide with ammonia (NH3), we conclude: first, it is difficult and dangerous processes through the use of chemicals (secondary and tertiary amines or ammonia), and secondly - the complexity and long duration of the process.

Much simpler and more promising direction - improved method of recycling carbon dioxide by supplying liquid carbon dioxide to a depth of 450 m area containing hydrogen sulfide (H2S) at least 1.5 mg / L, and then the soil to a depth of 1-3 m. This significantly efficient and reliable method for depositing carbon dioxide as it hydrates, which will keep the acid balance of sea water, plankton content will increase revenue and prevent carbon dioxide into the atmosphere from the sea. Such processing is environmentally friendly and has no negative impact on the ecological chain, but has a high cost and energy costs. The resulting plankton, which can be a source biosyrovyny remain at the bottom of the reservoir, which therefore not fully solve the problem.

One of the latest techniques in the field of bioenergy is the use of algae that are able to bind carbon and nitrogen under aerobic conditions, while stressing pure oxygen, and to accumulate in the cells of a large amount of lipids (80% on a dry weight) and a doubling of biomass every 40 hours - makes microalgae potential for their use in energy and other industries.

One ton fotoplanktonu during its growth absorbs 1.6 tonnes of CO2, while generating 1.2 tons of oxygen.

Today, the world of Algenol Biofuels, Dow Chemical, Global Green Solutions, GreenFuel Technologies and others have invested heavily to improve the

technology of mass cultivation in special installations (fotobioreaktorah) and in natural waters.

Today, in the direction of modernization of old thermal power plants with low efficiency and a record for the number of carbon dioxide into the atmosphere, developed a number of new technologies, one of which is the use of solid oxide fuel cells (SOFC - Solid Oxid Fuell Cell). The peculiarity is that they may one technological step of converting chemical fuel (H2 and CH4) in electricity with extremely high efficiency, which is around 70%. The use of fuel cells and biotechnology - odnin way to reduce emissions of carbon dioxide into the atmosphere, which can increase the energy efficiency of electrical energy and will build a self-sufficient system independent power supply facilities management with zero greenhouse gas emissions.

In SOFC-technology electrochemical generators, the electrolyte used solid ceramic material (yttrium stabilized zirconium oxide), which carries oxygen atoms from the cathode to the anode at a temperature of over 1000 ° C. High temperatures stack allow the use of contaminated fuels, biogas, gases formed during pyrolysis or gasification. Energy efficiency stacks of more than 70%

Industrial cultivation of microorganisms solved by selecting the flue gases of power plants and the subsequent injection of cultivators, where the absorption of carbon dioxide by microalgae. Through the use of sensors and test module supported by rational gas and mineral composition of the culture medium and appropriate insolyatsiyno-temperature conditions, which provided heat and mass transfer systems.

Waste gases from fuel cells to enter the chamber exhaust with ambient air that is clean (dust and coarse particles) through wet filters (neutralization of hydrogen sulfide and microorganisms by chemical interaction with Na2CO3). Filtered gas mixture gets a cultivator and forms tiny bubbles, which in turn enrich microorganisms carbon dioxide and stir them through aerliftu. The back of the cultivator in the shape of a heat exchanger with a black color, which increases the absorption of solar radiation cultivator and allow it to heat up under the influence of solar radiation to 25OS. Placing a cultivator microorganisms are necessary sunlight

through its transparent front surface. Due to the data from the sensor light, pH, salt concentration, KVM regulates the level of light through extra light diode strips (located on the side walls of the cultivator) and corrects the culture medium by introducing an additional portion of its container cultivation.

An important element in the process of cultivation is ambient temperature regulation which is due to heat transfer from the capacity to heat water through the heat exchanger system.

Conclusions

1. The basic methods of disposal of carbon dioxide and found that the known processes are complex, long and dangerous because of the use of chemical compounds (secondary and tertiary amines or ammonia).

2. Grounded implementation mikrobiotehnolohiy based fotobioreaktoriv in the grid of solid oxide fuel element for filtering biogas from CO2 and allows for more weight lipids as raw material for further fermentation and synthesis of biodiesel.

3. The technological scheme continuous process intensification cultivation of microalgae for lipid commercially and absorption of carbon dioxide from flue gases generated by the power plants based on solid oxide fuel cells SOFC.