

**СЕКЦІЯ 5. МОДЕЛЮВАННЯ РОБОЧИХ ПРОЦЕСІВ В
ТЕПЛОТЕХНОЛОГІЧНОМУ, ЕНЕРГЕТИЧНОМУ
ОБЛАДНАННІ ТА ПРОБЛЕМИ ЕНЕРГОЗБЕРЕЖЕННЯ**

HIGH PRESSURE ELECTROCHEMICAL GENERATOR OF HYDROGEN

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A new technology for electrochemical generation of hydrogen and oxygen by using metals of changeable valence as electrode materials, which has a lot of advantages in comparison with traditional methods for hydrogen and oxygen generation by electrolyses, has developed.

Oxidation of an active sponge electrode as the principal electrochemical reaction made it possible to reduce power consumption for production of 1 m³ hydrogen to 3,85 - 4,1 kW.h (traditional alkaline electrolyzers have power consumption from 4,3 kW.h/m³ to 5,2 kW.h/m³). Gas pressure interval is determined to be from 0,1 MPa to 70,0 MPa within the range of operating temperatures of electrolysis 350 – 423 K. Hydrogen is liberated on the passive electrode in the gaseous state and oxygen is chemically coupled with the active electrode (being accumulated as a chemical compound). Hydrogen liberation is accompanied by voltage growth and the given value the potential switch changes polarity. The passive electrode becomes the anode, and the active electrode becomes the cathode. The gaseous oxygen is liberated on the passive electrode and the active mass is reduced on the cathode. With reducing the metal of chemically active element the polarity is switched and the cycle is repeated.

The important part of the way proposed of hydrogen generation is the method developed for the gas absorbing electrode of the applicable structure, the use of which essentially reduces irreversible consumption during the electrochemical reaction of water decomposition. Cyclic generation of hydrogen and oxygen excludes the necessity of membranes that increases reliability and safety of operation and provides generation of hydrogen and oxygen within the wide range of pressure. The technology proposed does not use metals of platinum group as electrode materials. The technology developed is designed for wide-scale introduction into the objects that use renewable energy sources and also in the industry where hydrogen is used as the technological product (chemical, metallurgical, food and other industries) or as an ecologically clean energy carrier.

The technological regimes of electrolysis cell with gas absorbing electrode have been developed and regime performances which minimize power consumption to generate hydrogen at high pressure have been determined.