LOW-TEMPERATURE HYDROGEN-OXYGEN BATTERY OF FUEL CELLS WITH ALKALINE ELECTROLYTE

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Hydrogen-oxygen battery of fuel cells on the base of material, not containing precious metals, working in the alkaline electrolyte at the temperature 60-70 ° C was designed. Skeleton nickel , received by lixivation of alloy 50 % Al + 47% Ni + 3% Ti was used as a catalyst for the fabrication of hydrogen electrodes. Raney catalyst processeds by 20 % (mass.) suspension of fluoroplast F-4D with following drying in the vacuum under 50 ° C. Processing of pyrophoric skeleton nickel by fluoroplast F-4D suspension allows to prevent piroforic catalyst from the spontaneous combustion and serves as hydrophobic connecting when the electrodes are shaping. Electrodes consists of two layers: active, containing catalyst (skeleton nickel) and hydrophobic connecting, and locking layer from the porous nickel. Nickel net with the size of cells 400 μm was welded for perfecting current conductor and pressing mass of electrode to porous locking layer. Electrodes were pressed and then caked in the atmosfere of hydrogen during 1 hour with the after-treatment in atmosphere of technical nitrogen. Density of current of hydrogen electrodes on the base of skeleton nickel with locking layer from the porous nickel foil formed 90-100 mA/cm^2 at polarisation 0,1 V. Active coal, promoted by nickel-cobalt spinel, are used as oxygen electrodes . Density of current, taking out from such electrodes in the alkaline electrolyte, at the temperature 70 ° was 80-100 mA/cm^2 at polarisation 0,2 V. Hydrogen and oxygen electrodes with the working surface 350 cm^2 were made for the battery of fuel cells. General size of electrode from 8 sections with current conductor by the frame formed 200-300 mms.

Check tests of electrodes passed in individual element cells of natural sizes. Density of current of such element was 500 A/m^2 at the voltage 0,75 V and temperature 60-70 °C. Presenting of gaseous fuel and oxidizer was realized under the pressure not exceeding 20-25 κPa.

Battery of fuel cells by the power in 1 kW contained four blocks on 36 elements each, united consecutively and consisted of the following nodes:

1. pneumatic system of presenting a fuel and oxidizer;
2. systems to circulations an electrolyte;
3. systems of removing water;
4.system of control temperature and termoregulation;
5. commutation circuit, systems of conrol of the parameters ECG and voltage stabilisation for consumers.

Steady-state system of removing water from the electrolyte in the condenser - vaporizer was choose.The principle of boiling up of electrolyte at reduced temperature in creating vacuum in working system cavities was used. Developping battery of hydrogen-oxygen fuel cells by the power 1 kW was checked in laboratory conditions. ECG battaries formed 36 V. At the battery voltage 25,2 v the current of load formed 50 A.

Conducted laboratory tests of low-temperature hydrogen-oxygen battery of fuel cells attests on its capacity to work.

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