Fuel cell

Operation with solar cell and electrolysis cell

Object of the experiment

1. Demonstrating the transformation of energy in a fuel cell

Setup

Safety note:

Wear safety goggles while filling potash lye into the electrolysis cell and while discharging gases.

As hydrogen is highly flammable, do not approach a free flame to the experimental setup.

Preparing the fuel cell:

- For moistening the proton exchange membrane, lay the fuel cell with the H_2 side down, and fill in distilled water from the wash bottle through the gas inlet tube.
- Close the O_2 gas inlet tube with the black plastic cap, turn the fuel cell on the other side, and fill in water on the H_2 side.
- After approx. 1-2 minutes, set up the fuel cell upright and remove the water by blowing in air.
- Connect the motor with propeller to the voltage output of the fuel cell.

Preparing the electrolysis cell:

- The cocks being open, fill in potash lye via the feed vessel just up to the openings of the cocks.
- Connect the gas tubings of the electrolysis cell to the gas inlet tubes of the fuel cell (O_2 is generated at the positive electrode, H_2 at the negative one!).

Preparing the solar cell:

- Connect the two solar cells in series by setting the bridge plug, and connect them to the electrolysis cell, paying attention to the polarity.

Apparatus

1 fuel cell, PEM	667 401
1 motor with propeller	666 487
1 electrolysis cell	664 432
1 distilled water, 1l	675 3400
1 potash lye, 500 ml	672 4410
1 wash bottle, 250 ml	661 242
1 solar cell	664 431
1 pair of cables, 100 cm, red/blue	501 46
1 flood light lamp, 1000 W	450 70
or	
1 halogen lamp housing, 12 V, 50/90 W	450 64
1 incandescent lamp, 12 V/90 W	450 63
1 transformer, 2 to 12 V; 120 W, 230 V	521 25
1 pair of cables, 100 cm, red/blue	501 46
1 stand rod, 25 cm	300 41
1 Leybold-multiclamp	301 01
1 stand base, V-shape, 20 cm	300 02

Carrying out the experiment

- Illuminate the solar cells with the flood light lamp or with the halogen lamp (distance approx. 50 cm).
- In the beginning keep the cocks of the electrolysis cell closed.
- When a small gas reservoir has formed in the electrolysis cell (after approx. 3-5 minutes), open the cocks, and observe the propeller of the motor.

Observation

If the fuel cell is supplied with a sufficient amount of oxygen and hydrogen, the propeller of the motor starts to rotate.

Evaluation

In a fuel cell, chemical energy is transformed into electrical energy in an electrochemical process.

Remark:

The experimental setup is suited to demonstrate other transformations of energy:

Solar cell:	energy of light	→	electrical energy
Electrolysis cell:	electrical energy	→	chemical energy
Motor:	electrical energy	→	mechanical energy

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