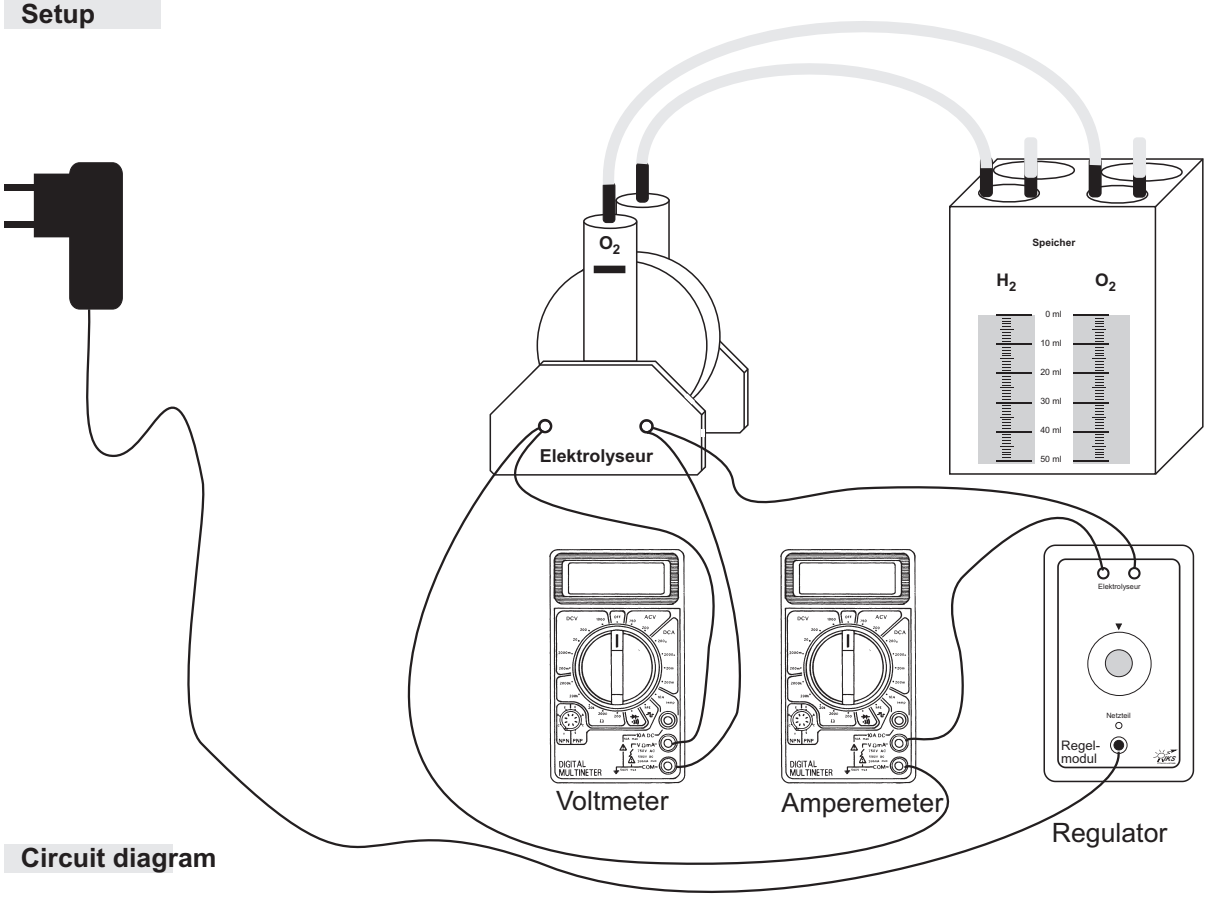
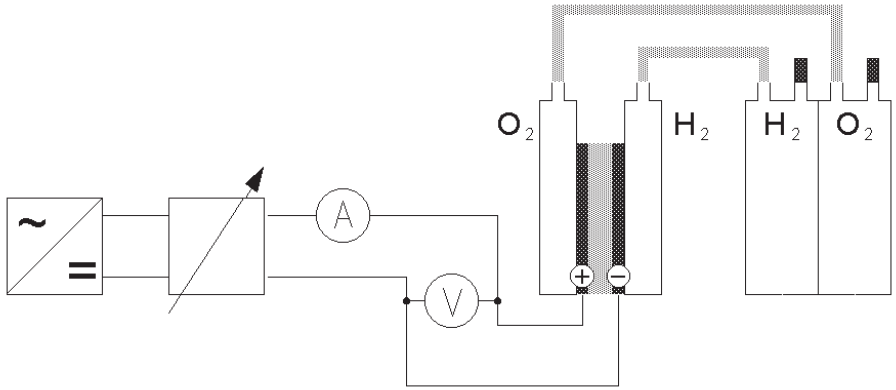
Determining the Current - Voltage Characteristic Curve of the Electrolyser

Experiment 4

Setup



Circuit diagram



Information

The electric properties of the electrolyser can be seen best when examining the current-voltage characteristic curve. It will be examined more closely in this experiment.

Task

Set up the experiment according to the figure above.

Observe the polarity at the electrolyser!

Close the right connecting sleeves of the gas storage with the fitting caps to prevent gas from streaming out.

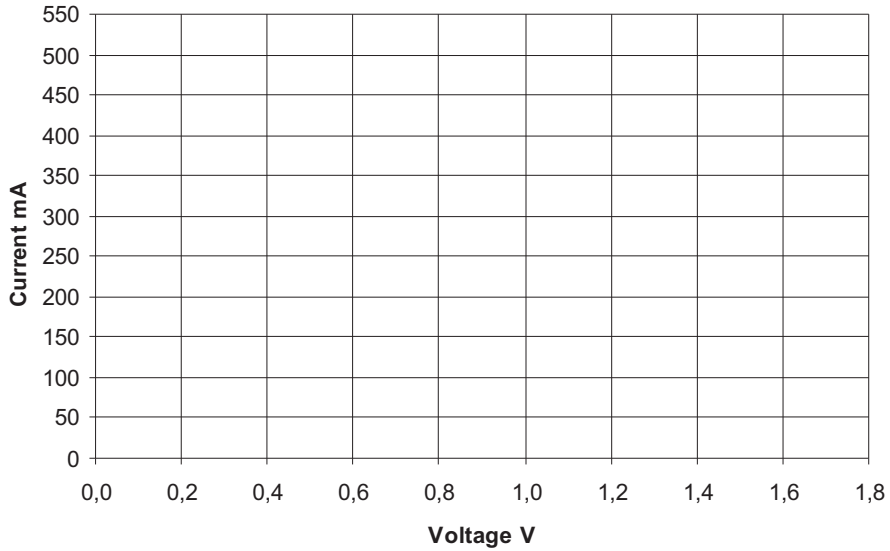
Set the amperemeter to the range 2000 mA DC and the voltmeter to the range 20 V DC.

Conduct measurements with different current values.

Set the pre-determined current value via the regulator and register the corresponding voltage value in the right-hand table.

Current I in mA	Voltage U in V
0	
20	
40	
60	
100	
200	
300	
400	
500	

Current-voltage characteristic curve of the electrolyser



1. Register the values in the diagram and draw the regression curve.

2. What is noticeable about the current-voltage characteristic curve? Give reasons.

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Information

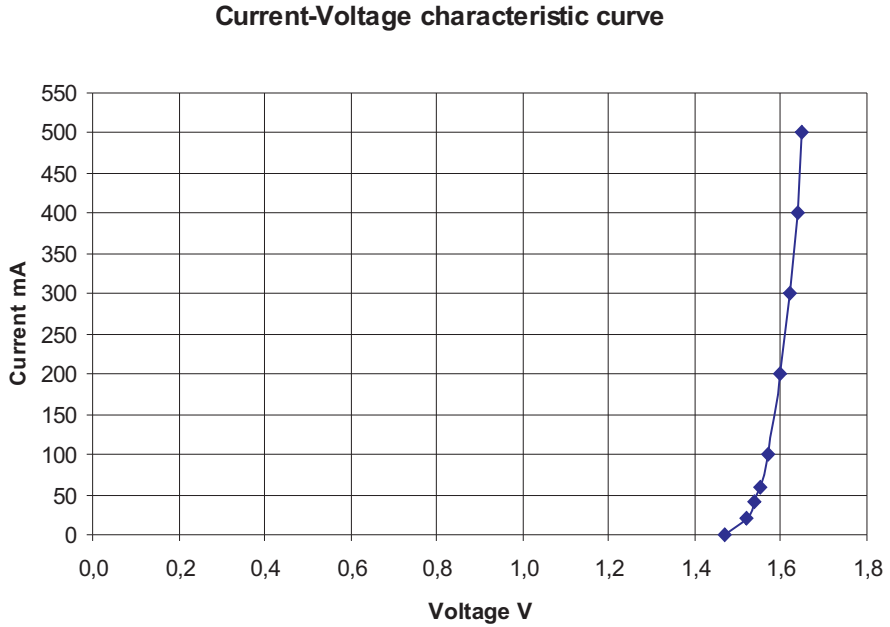
Measuring time: approx. 10 min
Learning target: I / U characteristic curve, electric properties of the electrolyser

The I / U characteristic curve shows the electric properties of the electrolyser.
The current is pre-determined for every measuring point using the regulator and the corresponding voltage is read from the voltmeter.
Since the curve is curved in lower currents, several measured values should be recorded from 0 to 100 mA. Beyond this threshold, one measured value per 100 mA is sufficient.

It is remarkable that the characteristic curve does not cross the origin, unlike other loads (resistor, electric motor, bulb).
This means that a minimum voltage must be supplied, the so-called practical decomposition voltage, before the electrolysis starts and a current flows.

The characteristic curve also shows that the voltage increases along with the current. This underlines the result obtained in experiment 3 and enables an evaluation of the efficiency factor.

Current I in mA	Voltage U in V
0	1,47
20	1,52
40	1,54
60	1,55
100	1,57
200	1,60
300	1,62
400	1,64
500	1,65



1. Register the values in the diagram and draw the regression curve.

2. What is noticeable about the current-voltage characteristic curve? Give reasons.

The I / U characteristic curve does not cross the origin. Electrolysis starts only at 1.4 V. The voltage increases with an increasing current. Below a voltage of approx. 1.4 V there is no electrolysis taking place, since the electric potential for the decomposition of water is not sufficient. Electrolysis starts only when the voltage reaches the practical decomposition voltage of approx. 1.4 V. This voltage is composed of the individual redox potentials (1.23 V, theoretical decomposition voltage) and the losses (excess voltage) in the cell. With an increasing current, the losses increase and therefore the voltage also increases.