Chemistry, Electrolysis (Iva Kubištová)

Time
90 min

Topic
experimental study of electrolysis

Lesson goals
Students (16 – 18) via experimental methods learn principle of electrolysis. They will improve their experimental skills.

Whole task first

Usually, in lab works the students get only an exact list of instructions, what to do. In this laboratory work they get at first the main question, than they have to explain principle of it. The question is : What is principle your experiment? The students can choose easy task (Task one), midly easy task (Task two) or difficult task (Task three). They will have a manual for experiments and after execution groups need find their own and then common principle of it.

Task one (SIMPLE ELECTRICAL CELL)
Student use mold making ice, zinc galvanized nails, Cu wires and LED diode for construction simple electrical cell.

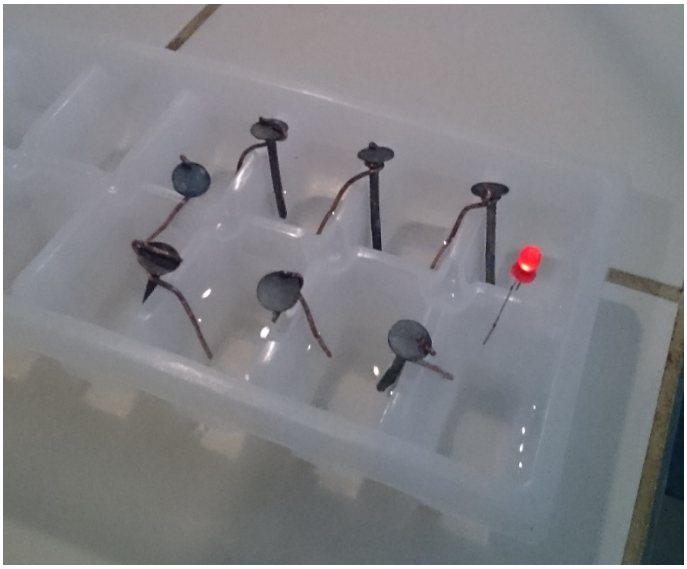
MANUAL for SIMPLE ELECTRICAL CELL

Materials

- mold making ice with separate spaces for water
- 7 or more zinc galvanized nails (about 6 cm long)
- 7 or more Cu wires (about 6 cm long)
- 5 % solution NaCl
- LED diode

Procedure

1. Prepare nails and wires as is in the picture below.
2. Pour NaCl solution (5g of NaCl in 95mL of water) into shapes in mold making ice.
3. Place nails and wires as is in picture below.
4. Connect LED diode as is in picture.
5. Explain, what was happen.



more on link:

https://nationalmaglab.org/education/magnet-academy/watch-play/interactive/simple-electrical-cell

Task two (VOLTAGE IN POTATO)
Student use potatoes to create voltage.

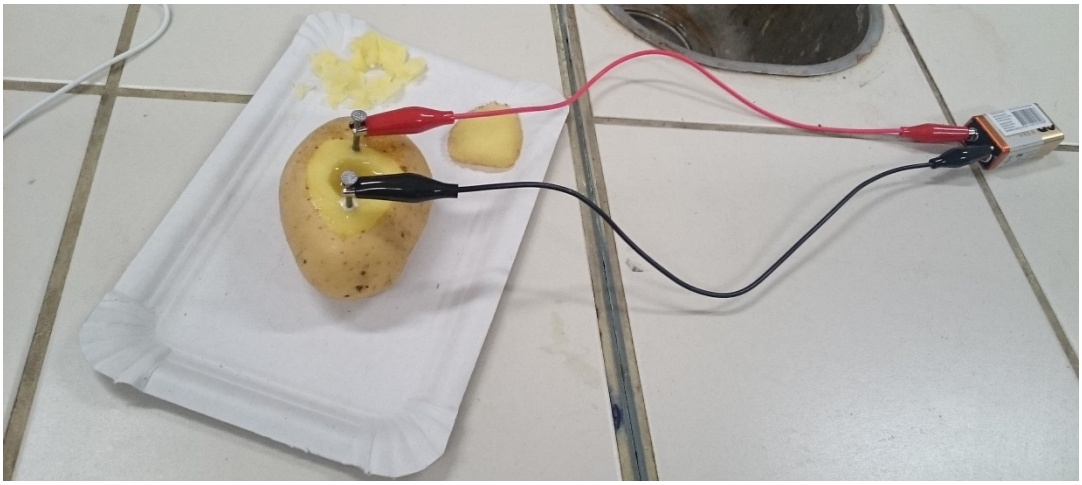
MANUAL for VOLTAGE IN POTATO

Materials

- a fresh potato
- as electrode two nonfat nails, Alligator clips/ Leads, 9V battery
- 20 % solution KI

Procedure

1. Take a potato and make hole with nonfat nails (about 2,5 cm deep).
2. Pour KI solution (20g of KI in 80mL of water) into holes.
3. Place two electrodes and connect Alligator clips/ Leads and 9V battery.
4. Disconnect it and cut potato as in the picture after 15 minutes.
5. Surroundings of one electrode is blue.
6. Put phenolphthalein near second electrode.
7. Explain, what was happen in potato after connecting and after 15 minutes?



Task three (TIN MAN)

Electrolysis of tin(II) chloride grow a beautiful “tin-man” crystal tree by running an electric current through a solution of tin(II) chloride.

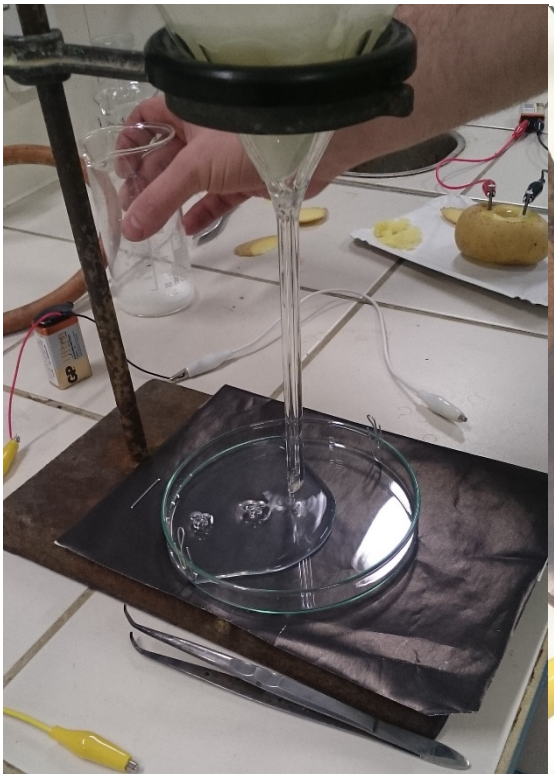
MANUAL for TIN MAN

Materials

- Tin(II) chloride, $SnCl_2$, 5 g
- Water, distilled or deionized, 100 mL
- Petri dish , Beaker 250-mL
- Support stand , funnel and filter flask, filter paper
- Battery, 9-V , Battery cap with alligator clip, leads
- Paper clips, small, 2

Procedure

1. Attach two papers clips to opposite sides of a clean glass Petri dish. Be sure the long ends of the paper clips are on the inside of the dish, nearly touching the bottom.
2. Dissolve 5 g of tin(II) chloride in 100 mL of distilled or deionized water in a 250-mL beaker.
3. Filter the tin(II) chloride solution and allow the liquid to drip into the Petri dish.
4. Collect enough liquid to just cover the bottom of the Petri dish. Attach the alligator clips from the 9-V battery cap to each paper clip.
5. Hook the battery cap to the 9-V battery and observe the changes at the anode and the cathode. A milky white precipitate of tin(IV) chloride appears at the anode and metallic tin(0) crystals form at the cathode.
6. Allow the current to run for approximately one minute to see the continued growth. The tin(0) crystals form feather like projections and grow across the dish.
7. Explain, what was happen.



All procedure (and more) you can see on link:
https://www.flinnsci.com/api/library/Download/2a738661a20c47b6a1d9f28fc30735be

Cunclusion of whole lesson

All student are working in groups, and comparing their results. The teacher helps to finish the formulas.

Notes for teachers:

Teacher can used these experiments for next terms or names: wet cell, voltaic (or galvanic) electrical cell, electrochemistry, Luigi Galvani, Alessandro Volta, battery, electrolyte, redox processes (oxidation, reduction), potential (voltage) difference, circuit, flow of electrons, flow of ions, electrode (anode, cathode), conduction of electricity (polarization), ionic current

Source of pictures

author