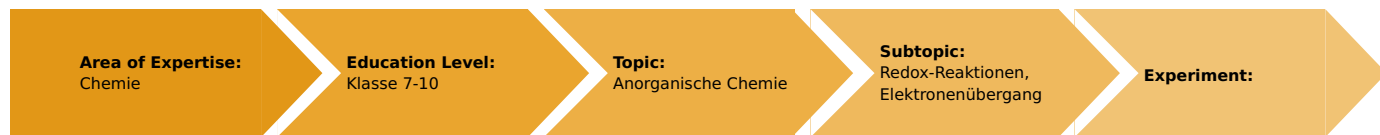


Introduction to the electron-transfer reaction

(Item No.: P1033000)

Curricular Relevance



Difficulty



Easy

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



1 Student

Additional Requirements:

- Water
- Emery paper
- Iron nails
- Wax pencil

Experiment Variations:

Keywords:

Task and equipment

Information for teachers

Learning objectives

- Base metals separate noble metals from their saline solution and go into solution themselves.
- The reactions taking place are electron-transfer reactions and thus redox reactions.

Notes on set-up and procedure

Preparations

The required saline solutions can be prepared beforehand in order to reduce the timer required for the experiment. The concentrations of these solutions are relatively variable under the experimental conditions chosen. Though all types of commercially available iron nails can be used, steel nails are not suitable.

Remarks on the students' experiments

The copper sulphate solution in part 2 of the experiment should not be too concentrated. It is sufficient when the solution is clearly blue. If, however, the solutions are too concentrated, large amounts of iron wool are necessary for achieving a change in colour.

Remarks on the method

This experiment serves as an introduction to the basic principles of electrochemistry. It is necessary to provide the students with information on an extended redox concept (electron release/electron acceptance) so that they can interpret and answer the questions and exercises stated.

Hazards



Heavy-metal salts are hazardous to health. Do not swallow them!

Waste disposal

- Collect the iron sulphate solution in a special reservoir marked accordingly for further experiments.
- Filter out the precipitated copper, dry it and collect it as a metal.
- Precipitate the residual solutions either as sulphides or bases and treat them as heavy-metal waste.

Introduction to the electron-transfer reaction

(Item No.: P1033000)

Task and equipment

Task

How do metals behave with regard to saline solutions?

Study the reaction of metals in saline solutions.

Hazards



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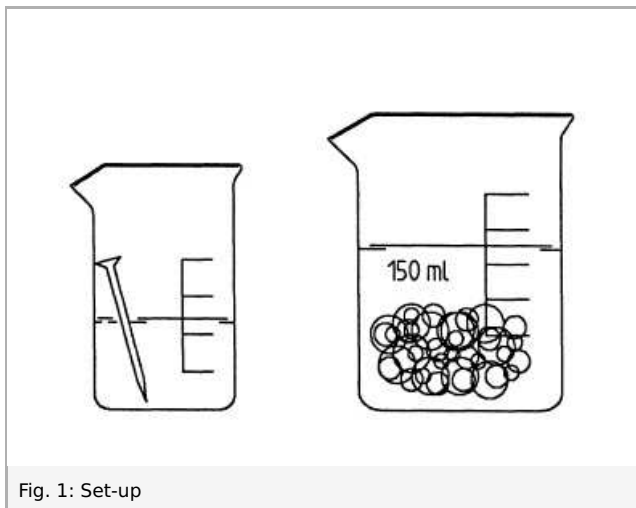
Equipment

Position No.	Material	Order No.	Quantity
1	Copper foil, 0.1 mm, 100 g	30117-10	1
2	Iron-II sulphate 500 g	30072-50	1
3	Copper-II sulphate,cryst. 250 g	30126-25	1
4	Iron wool 200 g	31999-20	1
5	Glass beaker DURAN®, tall, 50 ml	36001-00	2
6	Glass beaker DURAN®, short, 150 ml	36012-00	1
7	Scissors, l = 110 mm, straight, point blunt	64616-00	1
8	Spoon, special steel	33398-00	1
9	Glass rod,boro 3.3,l=200mm, d=5mm	40485-03	1
Additonal material			
	Water		
	Emery paper		
	Iron nails		
	Wax pencils		

Set-up and procedure

Set-up

- Number the two small glass beaker from 1 to 2.
- Fill a spoon of copper sulphate into beaker 1 and a spoon of iron sulphate into beaker 2. Add about 30 ml of water to both salts and dissolve them by stirring them.
- Use the scissors to cut off a strip of copper sheet of about 1 cm of width and about 5 cm of length.



Procedure

- Clean an iron nail and the strip of copper sheet by means of the emery paper until both of them have a shining surface.
- Dip the iron nail into the copper sulphate solution and the strip of copper sheet into the iron sulphate solution. Write down the result.
- Take the iron nail out of the solution and fill the residual iron sulphate solution together with the sediments into the large glass beaker. Fill it up with water until it contains about 100 ml of liquid and add a large pad of iron wool.

Waste disposal

Put the solutions into a special reservoir marked correspondingly.

Report: Introduction to the electron-transfer reaction

Result - Question 1

Write down your observations in a general form.

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Evaluation - Question 1

Draw the conclusions from your observations. Describe the processes that have taken place in the form of a reaction equation.

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Evaluation - Question 2

State the oxidised and the reduced substance. What can be said about the capability of the substances involved to donate electrons?

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Evaluation - Question 3

How could this process be used in a technological sense?

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Result - Table 1

Transfer your observations into the table.

Beaker	Reaction	Observations
1	yes	1 The iron nail beac
2	no	1 undefined 1
3	yes	1 The iron wool beac