

Worksheet 4.4

A colourful electrolysis – demonstration

The electrolysis of sodium chloride solution is useful in defining the changes taking place at the electrodes during the process. The key to success in this experiment is making detailed and careful observations. These will help you to understand what is taking place and to explain what you see.

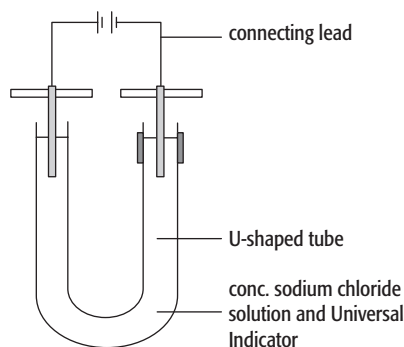
Apparatus and chemicals

- ◆ U-shaped tube
- ◆ clamp and stand
- ◆ two graphite electrodes
- ◆ two electrode holders
- ◆ two leads
- ◆ power pack
- ◆ 100 cm³ beaker
- ◆ conc. sodium chloride solution
- ◆ spatula
- ◆ Universal Indicator
- ◆ stirring rod
- ◆ distilled water
- ◆ eye protection

Safety

The products in this reaction are far more hazardous than the reactants. The demonstrator should wear eye protection when carrying out the experiment and particularly when clearing up.

Method



- ◆ A concentrated solution of sodium chloride, with sufficient Universal Indicator added to colour the solution green throughout, is placed in a U-shaped tube.
- ◆ Clean graphite electrodes are then fixed in position in each side of the U-shaped tube.
- ◆ Connecting leads are attached to the electrodes and then connected to a power pack set to 10 V.
- ◆ The power is turned on and you should observe closely what happens.
- ◆ The experiment is continued for about five minutes.

You should record all your observations, either descriptively or as a table of results. Make sure that you are clear which is the positive and which the negative electrode.

Observations

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Explaining the observations

1 What type of structure and bonding does solid sodium chloride have?

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2 What happens to the ions when sodium chloride is dissolved in water?

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Water (H₂O) is not a purely covalently bonded compound. Some of the water molecules split up into two ions, H⁺ and OH⁻.

3 List all the ions present in the solution at the start of the experiment.

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4 What is made at the positive electrode? How can you tell?

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5 Write a half-equation for the formation of this product.

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6 Which ions move towards the negative electrode?

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7 What is made at the negative electrode?

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8 Write a half-equation for the formation of this product.

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9 Which ions from the original list are still present? What is the name of the substance these ions form?

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10 Why does the indicator go purple near the negative electrode?

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Using the products

The electrolysis of sodium chloride solution produces **three** products. What are they?

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Find out what each of the products is used for.

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