HOFFMAN'S VOLTAMETER – with stand

GE5595-01 complete with stand, base & pair of platinum electrodes.

The Hoffman's Voltameter is a set of 3 vertical glass tubes that are joined so that a fluid filling the longer centre limb will completely fill the other two shorter limbs.

The shorter limbs are graduated to 50ml and each is fitted with a glass tap at the highest point. The bottom of each limb is open so an electrode mounted in a rubber stopper can be sealed into the limb with the special material pointing upwards inside the limb and the electrical connection pointing downwards.

CAUTION: The Voltameter is made from glass and is very fragile. Handle with great care and do not stress the glass. Handle the taps and the electrodes gently.

NOTE: If water it is very pure or very 'soft' (has only a very small percentage of minerals), it is a very poor conductor of electricity. To make 'soft' water conduct electricity at low voltage, add a few grams of sodium nitrate ($NaNO_3$) or a few grams of table salt to the water and mix thoroughly before filling the Voltameter.

The Voltameter is supported on a metal stand with spring clips supporting the glass and a heavy metal base for stability. The picture shows only the glass components.

USING THE HOFFMAN'S VOLTAMETER:

The normal use of the Hoffman's Voltameter is to electrolyse water into the gases Hydrogen and Oxygen. Using carbon electrodes, Hydrochloric acid can be used as an electrolyte and the Hydrogen and Chlorine gases can be obtained. Again using carbon electrodes, Ammonia can be disassociated into Nitrogen and Hydrogen, but, by far, the most normal experiment (and the safest and cleanest) is using platinum electrodes and water electrolyte.

Carefully pour the electrolyte into the glassware using the centre limb. To eliminate all air bubbles while filling through the centre limb, open the taps slightly to let the air escape and close them when water begins to flow out of them. Be sure the two platinum electrodes are fitted securely into the side limbs and that all the joints are leak-tight.

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Take a DC power supply or a sturdy battery and connect the electrodes to about 6 to 12V.DC. It can be either full wave (unsmoothed) or smoothed DC. A small current flows through the water and bubbles can be seen forming around the platinum electrodes. These bubbles break free from the electrodes and rise up the side limbs to form a gas column under each tap.

Notice the volumes of gas formed. Notice that one volume is close to double the other volume. Since water is H_2O, it is likely that there would be double the volume of Hydrogen. To determine which gas is which, invert a test tube over one of the taps and slightly open the tap until water rises to the tap. The gas escapes into the test tube but while withdrawing the test tube, place your thumb over the mouth of the test tube to hold the gas in.

Test for Hydrogen: If ignited as it flows into the air, it will softly 'pop' as a slight explosion occurs.
Test for Oxygen: If a glowing splinter is inserted into oxygen it will glow more brightly or will ignite.

Note that the Hydrogen gas is formed over the negative electrode (the Cathode) and Oxygen is formed over the positive electrode (the Anode).

There are more advanced experiments that can be performed relating to electroplating and the relationship between the current flowing and the amounts of gases created or solids deposited. These experiments must be taken from your text books.

SPARES:

PA1412-01 platinum electrodes, pair, (for water) as pictured…….

PA1399-01 carbon electrodes, pair, (for ammonia or hydrochloric acid)

PA1429-01 Centre glass limb
PA1439-01 Left hand glass limb, 50ml, graduated, with tap.
PA1449-01 Right hand glass limb, 50ml, graduated, with tap.
PA1459-01 Steel support stand assembly, with base.

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