Avogadro's law

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Principle

In 1811, Avogadro stated his hypothesis that under the same conditions of pressure and temperature, equal volumes of all gases contain equal numbers of components (molecules, atoms). He derived this from the uniformity of the behaviour of (ideal) gases on increases in temperature and pressure (see the Gas Laws) and the Law of Volumes. When Avogadro's supposition is correct, then 6 parts by volume of CO and 3 parts by volume of O_2 must form 6 parts by volume of CO_2 when pressure and temperature are the same before and after the reaction. Similarly, at a temperature a little above 100°C, a gas mixture containing 6 parts by volume of H_2 and 3 parts by volume of O_2 must give 6 parts by volume of steam, and a mixture containing 5 parts by volume of H_2 and 5 parts by volume of Cl_2 must give 1 0 parts by volume of HCI. In the following experiments we will carry out the reactions named above to test the correctness of the hypothesis.

Benefits

- Safe and controlled test procedure by slow eudiometer
- Practical gas bar for storing the gases
- Special heater for glass jacket for optimal temperature control

Tasks

Perform the following reactions to verify Avogadro's law:

1. Preparation of carbon monoxide and chlorine
2. The carbon monoxide/oxygen reaction
3. The hydrogen/oxygen reaction at above 100°C
4. The hydrogen/chlorine reaction at above 100°C

Learning objectives

- Avogadro's law
- Gas laws
- Carbon monoxide
- Hydrogen
- Chlorine
- Oxygen

Necessary accessories

- Precision balance 620g/0.001g

Scope of delivery

Glass jacket	02615-00	1
Plunger eudiometer	02611-00	1
Ignition spark generator	11155-00	1
Connecting cord, 30 kV, 1000 mm	07367-00	2
Gas bar	40466-00	2
Heating apparatus for glass jacket system	32246-93	1
Power regulator	32288-93	1
Support base DEMO	02007-55	1
Support rod, stainless steel, different lenghts	02031-00	2
Support rod, stainless steel, different lenghts	02037-00	2
Retort stand, h = 750 mm	37694-00	1
Right angle boss-head clamp	37697-00	3
Universal clamp	37715-01	3
Round bottom flask, 100ml, GL 25/12	MAU-27100001	1
Funnel for gas generator, 50 ml, GL18	MAU-27222500	1
Gas syringe, 100 ml	02614-00	1
Syringe 10ml, Luer, 100 pcs	02590-10	1
Cannula 0,45x13 mm, Luer, 20 pcs	02598-10	1
Lab thermometer,-10..+150C	38058-00	2
Steel cylinder oxygen, 2 l, filled	41778-00	1
Steel cylinder hydrogen, 2 l, full	41775-00	1
Reducing valve f.oxygen	33482-00	1
Reducing valve for hydrogen	33484-00	1
Table stand for 2 l steel cylinders	41774-00	2
Wrench for steel cylinders	40322-00	1
Teclu burner, DIN, natural gas	32171-05	1
Safety gas tubing, DVGW, sold by metre	39281-10	1

Hose clip f.12-20 diameter tube	40995-00	2
Lighter f.natural/liquified gases	38874-00	1
Silicone tubing, inner diameter 3 mm	39296-00	2
Funnel, glass, top dia. 50 mm	34457-00	1
Beaker, Boro, high-form	46027-00	1
Graduated beaker, 1000 ml, plastic (PP)	36640-00	1
Spoon, special steel	33398-00	1
Boiling beads, 200 g	36937-20	1
Formic acid 75% 250 ml	30023-25	1
Sulphuric acid, 95-97%, 500 ml	30219-50	1
Hydrochloric acid 37 %, 1000 ml	30214-70	1
Potassium permanganate, chem. pur., 250 g	30108-25	1
Sodium chloride, 500 g	30155-50	1
Water, distilled 5 l	31246-81	1
Lab protecting glasses with UV filter	39315-00	1
Base plate for support base DEMO	02007-01	1