

Partial molar volumes

Article no: P3020501



Principle

Due to intermolecular interactions, the total volume measured when two real liquids (e.g. ethanol and water) are mixed deviates from the total volume calculated from the individual volumes of the two liquids (volume contraction). To describe this non-ideal behaviour in the mixing phase, one defines partial molar quantities which are dependent on the composition of the system. The values of these can be experimentally determined.

Benefits

- An illustrative fundamental experiment in thermodynamics
- Visualising the difference between ideal and real behavior

Tasks

1. Measure the densities of different ethanol-water mixtures of specified composition at 20 °C with pycnometers.
2. Calculate the real volumes and the mean molar mixing volumes of the investigated ethanol-water mixtures and also the partial molar volumes of each liquid for selected compositions.
3. Compare them with the molar volumes of the pure substances at 20 °C.

Learning objectives

- Principles of thermodynamics
- Ideal and non-ideal behaviour of gases and liquids
- Volume contraction
- Molar and partial molar quantities

Necessary accessories

- Precision balance 620g/0.001g

Scope of delivery

Immersion thermostat Alpha A, 230 V	08493-93	1
Bath for thermostat, makrolon	08487-02	1
External circulation set for thermostat Alpha A	08493-02	1
Support base DEMO	02007-55	1
Support rod, stainless steel, different lengths	02032-00	2
Right angle boss-head clamp	37697-00	5
Universal clamp	37715-01	4
Pycnometer, calibrated, 25 ml	03023-00	9
Bottle, narrow mouth, clear	41101-01	9
Funnel, glass, top dia. 50 mm	34457-00	9
Beaker, Boro, high-form	46025-00	2
Pasteur pipettes, 250 pcs	36590-00	1
Rubber caps, 10 pcs	39275-03	1
Rubber hose	39282-00	3
Hose clip, diam. 8-16 mm, 1 pc.	40996-02	4
Wash bottle, plastic, 500 ml	33931-00	1
Ethyl alcohol, absolute 500 ml	30008-50	1
Water, distilled 5 l	31246-81	1
Tubing connector, ID 6-10mm	47516-01	2