

Molecular refraction

Chemicals

- Sample substance
- Distilled water

Materials

- Pycnometer
- Water bath
- Refractometer
- Analytical balance

Task:

Determine the molecular refraction R_D of an organic liquid

Principle:

The molecular refraction R_D is a matter constant and can be used to determine the structure of organic substances.

For the determination of R_D it is necessary to examine density, refraction index and molar mass first. R_D is to be calculated according to the following equation:

$$R_D = \frac{(n^2 - 1) M}{(n^2 + 2) \rho}$$

Operating instruction:

1. The density of the liquid at 20°C is to be determined by using a pycnometer
2. The index of refraction of the liquid is to be determined at 20°C by using a refractometer
3. The molar mass of the liquid will be announced by the examination board

Waste disposal:

- Dispose all wastes in the container for halogen free solvents

Analysis:

- Sample No: _____
- Found density: _____ g/mL
- Found index of refraction.: _____
- M(liquid): _____ g/mol
- Molecular refraction R_D _____ mL/mol

Preparation list

Chemicals:

	Density at 20°C [g/mL]	Refraction index at 20°C	Molar Mass [g/mol]	R _D
Toluene	0,8670	1,4969	92,14	31,09
o-Xylene	0,8811	1,5050	106,18	35,74
p-Xylene	0,8610	1,4958	106,18	36,01
Heptane	0,6836	1,3878	100,21	34,58
Cyclohexane	0,7783	1,4254	84,16	27,67
Propane-2-ol	0,7851	1,3771	60,10	17,61
Propane-1-ol	0,8035	1,3853	60,10	17,54
PropanoneAcetone	0,7905	1,3589	58,08	16,17
Pentane-1-ol	0,8198	1,4089	88,15	26,58
Ethyl ethanoate	0,9005	1,3726	88,11	22,27
Ethanol	0,7940	1,3623	46,07	12,88

- Every examinee is to be given 100 ml of sample solution

Tools:

- Pycnometer
- Water bath
- Refractometer
- Analytical balance