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MEASUREMENT AND INSTRUCTIONAL CAPABILITIES

- > Accurate measurement of mass transfer rates in the absence of convective effects
- > Use of Fick's Law to deduce diffusion coefficients from measurements of mass transfer rate and concentration difference
- > Simple analysis of a first order unsteady state process effect of concentration on diffusion coefficients
- > Gaining familiarity with the use of laboratory instruments to achieve accurate measurements of data required for industrial process design
- > Windows data logging software included

This laboratory equipment has been designed to enable measurement of molecular diffusivities and, in so doing, to familiarise students with the basic notions of mass transfer theory.

The liquid diffusivity apparatus (CERb) relates to an equi-molar counter-diffusion process.



DESCRIPTION

Armfield has developed a unique diffusion cell which overcomes the traditional problem of slow diffusion rates in liquids requiring long observation times, but without sacrificing accuracy or introducing convective effects. Essentially, the cell consists of a honeycomb of accurately dimensioned capillaries positioned between two liquids of differing concentration of the solute, whose diffusion coefficient is to be determined.

In practice, a small volume of concentrated solution is placed on one side of the honeycomb, whilst the other side consists initially of a large volume of pure solvent (water). As diffusion of the solute occurs, the concentration within the larger volume increases, and is monitored with a conductivity sensor and meter. The mixture is continuously stirred with a magnetic stirrer to ensure uniform concentration within the bulk liquid. Whilst the conductivity sensor may be readily calibrated for any required aqueous system, for introductory studies dilute solutions of sodium chloride are recommended, for which conductivity data is provided.

TECHNICAL DETAILS

Diffuser vessel: Capacity 1l
Conductivity meter: 3 ranges 199.9 μ S to 19.99mS
Computer output: RS232

RECOMMENDED ACCESSORIES

Stop clock
 Cartridge deioniser

REQUIREMENTS

Electricity supply: Battery operated

Data logging requires a customer supplied PC, with RS232 Serial interface, running Windows 98 or later.

COMPLEMENTARY PRODUCTS

CERa MkII: Gaseous Diffusion Coefficient Apparatus
CES: Wetted Wall Gas Absorption Column
UOP3BM: Batch Distillation Column
UOP3CC: Computer Interfaced Distillation Column
UOP4MkII: Solid-Liquid Extraction Unit
UOP5: Liquid-Liquid Extraction Unit
UOP7: Gas Absorption Column

ORDERING SPECIFICATION

- Bench mounted apparatus for the determination of diffusion coefficients of components in the liquid phase. The method employs a diffusion cell of capillary tubes so constructed to permit equimolar counter diffusion between liquids of differing concentration each side of the cell without convective effects being present
- Concentration changes on one side of the cell with respect to time are measured with the conductivity cell and the meter provided and a magnetic stirrer keeps the bulk solution well mixed
- Possible to obtain reproducible and accurate values of diffusivity within a period of 1.5 hours of practical laboratory time
- Battery powered

EXPERIMENTAL CAPABILITIES

- > Accurate measurement of mass transfer rates in the absence of convective effects.
- > Use of gas laws to calculate concentration differences in terms of partial pressures.
- > Use of Fick's Law to deduce diffusion coefficients from measurement of mass transfer rate and concentration difference.
- > Simple analysis of a first order unsteady state process
- > Effect of concentration on diffusion coefficients
- > Gaining familiarity with the use of laboratory instruments to achieve accurate measurements of data required for industrial process design
- Software is included to enable the temperature and conductivity in the diffusion vessel to be displayed, logged and recorded on a customer supplied PC, using an RS232 interface

OVERALL DIMENSIONS / NET WEIGHT

Height: 0.31m
Diameter: 0.19m
Conductivity Meter
Height: 0.13m
Width: 0.15m
Depth: 0.25m

SHIPPING SPECIFICATION

Volume: 0.10m³
Gross Weight: 10kg



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