

H-6271 Mass Transfer and Diffusion Coefficients

Purpose

The Hampden **Model H-6271** Mass Transfer and Diffusion Coefficients System has been developed to investigate the measurement of molecular diffusivities. The students will familiarize themselves with the motions of mass transfer theory. This system consists of two parts, liquid diffusivity relating to an equi-molar counter-diffusion process and gaseous diffusivity covering diffusion with bulk flow.

Description

The Liquid Diffusion Module consists of:

- Porcelain top stirrer with bar
- Diffuser vessel
- Diffusion cell
- Digital conductivity meter

The liquid diffusivity consists of placing a small volume of concentrated solution on one side of the diffuser while the other side consists of a large volume of pure solvent such as de-ionized or distilled water. As diffusion takes place, a conductivity cell within the diffuser vessel monitors the solvent. The stirrer keeps the concentration uniform.

The Gaseous Diffusion Module consists of:

- Power control Module
- Clear tank
- Immersion circulator with digital thermostat controller and thermometer
- Air pump
- Base assembly with leveler feet
- Microscope stage with microscope
- Solvent/air ejector assembly
- Micro-pipette with holder

The gaseous diffusivity of a vapor from a liquid such as acetone or methyl alcohol into another gas such as air can be studied by confining a sample of the liquid in the solvent/air ejector. The rate of evaporation is determined by measuring the rate of fall with the microscope mounted stage vernier scale.

Liquid Diffusion Module A →

Gaseous Diffusion Module B ↓



All Hampden units are available for operation at any voltage or frequency

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Experiment Capabilities

The H-6271 allows the student to do the following instructional and measurement activities:

Liquid Diffusion Module

- Gaining familiarity with the use of laboratory instruments to achieve accurate measurements of data required for industrial process design
- Accurate measurement of mass transfer rates in the absence of convective effects
- Simple analysis of a first order unsteady state process
- Use of Fick's Law to measure diffusion coefficients in the presence of stationary gas
- Effect of concentration on diffusion coefficients
- Option of using on-line microcomputer data logging and analysis (optional equipment required)

Gaseous Diffusion Module

- Gaining familiarity with the use of laboratory instruments to achieve accurate measurements of data required for industrial process design
- Measurement of the effect of temperature on diffusion coefficients
- Direct 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 measure diffusion coefficients in the presence of a stationary gas

Specifications

Liquid Diffusion Module A:

- Diffuser Clear Vessel: 1 liter
- Diffusion Cell
- Porcelain-top Stirrer:
 - RPM: 100 to 1000
 - Voltage: 120/220V AC 60/50Hz
 - Top Size: 49 sq. in.
- Stir Bar
- Conductivity Meter:
 - Display: Digital ½" (13mm)
 - Range: 0.1 to 200,000 μ mhos or μ s
 - Accuracy: \pm 0.3%
 - Temp. Display: °C and °F
 - Automatic temperature compensated and control recorder jack
- Diffuser Disc (20)

Gaseous Diffusion Module B:

- Base Assembly: 14 gauge furniture stock steel finished in instrument tan texture. Leveler feet are provided.
- Power control module: Plastic enclosure with 14 gauge furniture stock steel panel finished in instrument white enamel with black KEM silk-screen enamel nomenclature. Panel consist of one ground fault interrupter circuit breaker, two 1-pole circuit breaker with associated power receptacle for heater and air pump. Pilot light indicates when main power is available. Unit comes with power cord.

- Clear tank, 7 liter rated to 100°C
- Digital PID circulator with \pm 0.05°C accuracy. LCD display, adjustable over temperature/low liquid shut off with indicator and adjustable circulator pump
- Solid Teflon air pump for corrosive gases (acetone)
- Solvent air ejector
- Microscope with stand and measuring scale
- Micro-pipette, 200mL, glass with pipette holder
- Clear .250 I.D. vacuum hose

Accessories

Furnished:

- Module A: 1 - Spare diffusion cell
- Module B: 1 - Solvent air ejector

Not Furnished:

- Stop watch
- Water de-ionizer
- Organic solvent I.E. acetone

Services Required

Electrical: 120V AC, 1 ϕ , or
220V AC, 1 ϕ , 60/50Hz

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