GASEOUS DIFFUSION COEFFICIENT APPARATUS – CERa MKII

NEW MKII VERSION FEATURES ELECTRONIC USB MICROSCOPE AND AUTO SAMPLE TIME LAPSE IMAGERY AND VIDEO

Apparatus for investigation of mass transfer and gaseous diffusion has traditionally used a capillary tube in a hot water bath, with a travelling microscope used to measure the rate of diffusion over a period of time. Although capable of giving good results, this type of apparatus was not without its disadvantages, particularly ease of use.

Armfield have yet again introduced a radical alternative to the traditional methods, utilising the benefits of modern computer compatible microscopy, producing a novel system with a large number of benefits.

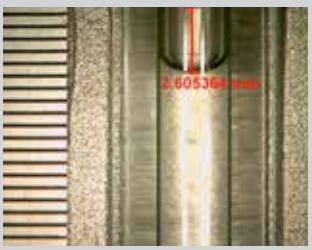
BENEFITS

> New approach using a computer linked high definition microscope
> Very easy to see the phase boundary, and to record images for analysis and reports
> Software includes accurate measurement facility for determining the rate of diffusion
> High measurement accuracy and resolution enables results to be obtained over a shorter timescale
> Software includes 'time lapse' facility to enable measurements to be taken automatically over extended time periods
> Suitable for other liquids with lower diffusion coefficients than the standard acetone (propanone) due to the 'time lapse' facility
> No water bath, small heater block is quick to set up and achieve a stable temperature
> Unlike water baths, it is safe to be left unattended for extended periods

INSTRUCTIONAL CAPABILITIES

> 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
> Measurement of the effect of temperature on diffusion coefficients
> Gaining familiarity with the use of laboratory instruments to achieve accurate measurements of data required for industrial process design
> Investigation into diffusion coefficients of alternative fluids

Screenshots show how the level of acetone in the capillary tube falls over time, and how the software accurately measures the level



Start position

End position

BM TRADA CERTIFICATION ISO 9001:2008 UKAS QUALITY MANAGEMENT 012

EXTENDED WARRANTY 2 years

DESCRIPTION

A small quantity of the volatile liquid to be investigated is placed in a capillary tube, which is positioned in a heated metal block. The block is heated by an electric cartridge heater and kept at a constant temperature using an electronic control loop.

A stream of air is passed across the top of the capillary tube, with a stationary layer of air above the liquid surface, creating a partial pressure difference between the liquid surface and the flowing air stream. As vapour diffuses from the liquid into the air stream, the amount of liquid in the tube reduces and the phase boundary between the liquid and the air drops. Measurement of how this phase boundary changes with time enables the molar mass transfer rate to be determined.

A slot in the heater block enables the phase boundary to be observed using a high definition microscope. This microscope produces high definition images onto a standard windows computer (not supplied).
The software provided with this microscope includes highly accurate measurement and an automated time lapse facility (either as video or multiple still images).

ESSENTIAL ACCESSORIES

Windows PC (not supplied) with USB2 interface

REQUIREMENTS

Electrical supply: Requires 24V dc at 2.5A
The equipment is supplied with a universal mains adaptor suitable for 100V to 240V ac, 50/60Hz

ORDERING CODES

CERa-MkII-EUR	with Shuko European style mains lead
CERa-MkII-UK	with UK style mains lead
CERa-MkII-B	with 115V US NEMA 5-15 style mains lead

OVERALL DIMENSIONS

Length:	0.27m
Height:	0.20m
Depth:	0.13m

SHIPPING SPECIFICATION

Volume:	$0.15m^3$
Gross weight:	5kg

ORDERING SPECIFICATION

- A self-contained bench mounted apparatus for the determination of diffusion coefficients of a vapour in air
- The apparatus blows air across the top of the capillary tube, inside diameter 2mm
- The tube is contained in a heated aluminium block with a 25W heater
- The temperature control system maintains the temperature of the block to better than +/- 1°C from ambient to 60°C.
- Operating temperature typically achieved in 20mins. (40°C operation)
- The equipment incorporates a high definition USB microscope with a resolution of 1600x1200 and preset to an optical gain of approximately x37
- Microscope and heater block containing the capillary are visible to the user and internal illumination of the capillary is provided.
- Viewing length of the capillary is 12mm
- Physical reference scale provided (can be used for software calibration)
- Phase boundary measurement resolution < 0.0002mm
- Powered by universal power adaptor with worldwide approvals
- Software can create individual images under operator control, multiple timed images under automatic control or time lapsed video. Images can be time and date tagged. Time lapse periods can be set from five seconds to many days.
- Output formats: .jpg .bmp .avi

EXPERIMENT CAPABILITIES

- 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
- Measurement of the effect of temperature on diffusion coefficients
- Gaining familiarity with the use of laboratory instruments to achieve accurate measurements of data required for industrial process design
- Diffusion coefficients of different liquids

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