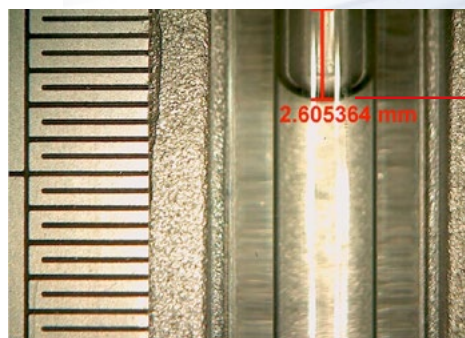


## Gaseous Diffusion Coefficient Apparatus - CERa-MKII

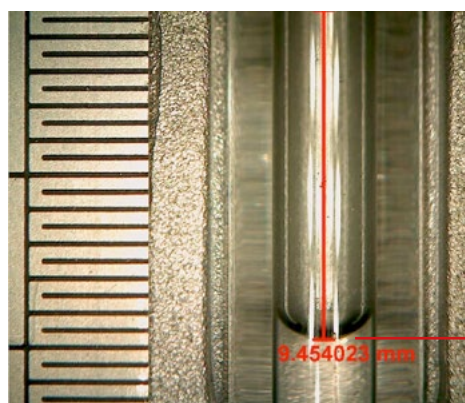
CERa MKII apparatus for investigation of mass transfer and gaseous diffusion has traditionally used a capillary tube in a hot water bath, with a travelling microscope used to measure the rate of diffusion over a period of time. Although capable of giving good results, this type of apparatus was not without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

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



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



### Experimental content

- ▶ To determine the diffusion coefficient of a gas by evaporation from a liquid surface
- ▶ 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
- ▶ Investigation into diffusion coefficients of alternative fluids
- ▶ Gaining familiarity with the use of laboratory instruments to achieve accurate measurements of data required for industrial process design

## 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).

## Requirements

## Scale



**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

Software requires the user to have a PC running Windows 7 or above with a USB port.



## Overall dimensions

Length	0.27m
Width	0.20m
Height	0.13m

## Packed and crated shipping specifications

Volume	0.15m <sup>3</sup>
Gross weight	5Kg

## 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

## Optional extras

- ▶ 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 block to be better than +/- 1°C from ambient to 60°C.
- ▶ Operating temperature typically achieved in 20minutes (40°C operation)
- ▶ The equipment incorporates a high definition USB microscope with a resolution of 1600 x 1200 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 include .jpg .bmp .avi



Cepiler tube detail

## Ordering codes

CERa-MkII

## Knowledge base

- > 28 years expertise in research & development technology
- > 50 years providing engaging engineering teaching equipment

Benefit from our experience, just call or email to discuss your laboratory needs, latest project or application.

An ISO 9001:2015 Company



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