

ミニチュアK-セル

Chell Instruments (英国)



【特長】

- ・コンパクトデザイン
- ・最小領域の蒸着を可能にする指向性
- ・安定した蒸着レート
- ・材料の汎用性のために、PBNライナーだけを簡単に交換できる独自のデザインによりユーザーは最大限の柔軟性を得ることができます。
- ・ICF70コンプリートアセンブリー(本体/シャッター/冷却機能)
- ・4種類のアパーチャサイズ

| 【構成】 | 製品コード |
|-----------------------------------------------------------|--------------------------------|
| ミニチュアK-セル本体 (シャッターアセンブリー付) | KC3-BODY |
| グラファイトルツボカートリッジ (標準) サーモカップル: タイプR (Pt-Rh) 20℃ - 1600℃ | KC3-GRA-R |
| グラファイトルツボカートリッジ (オプション) サーモカップル: タイプK | KC3-GRA-K |
| PBNライナー (2個x φ1mmアパーチャ付) | KC3-PBN |
| ミニチュアK-セル用温度調節付電源 (4mケーブル付) | VFK-CELL |
| 【仕様】 | |
| ミニチュアK-セル本体 | |
| (1) 最大制御温度 | 1600℃ |
| (2) ルツボ容量 | |
| 1) 高純度グラファイト | 0.5cc |
| 2) PBNライナー | 0.4cc |
| (3) 冷却方式 | 水冷又は液体窒素 (0.25l/min) |
| (4) サーモカップル | タイプR (Pt-Rh) 20℃ - 1600℃ |
| (5) アパーチャサイズ | (標準) 1mm/(オプション) 1.5mm/2mm/3mm |
| (6) ベーキング温度 | 250℃ |
| (7) 取付フランジ | ICF70 |
| (8) シャッター機構 | タイプ |
| ミニチュアK-セル用温度調節付電源 | |
| (1) 温度制御方式 | PID制御 |
| (2) 制御可能ヒーター電力 | 最大250W |
| (3) 温度制御安定性 | ±2℃又は0.3% |
| (4) 外形寸法 | 19"ラック (2U : 425x470x85mm) |
| (5) 重量 | 10.5kg |



Miniature K-Cell

Miniature Knudsen Evaporation Cell

- **Compact, self-contained evaporation cell.**
- **Unique cartridge design to facilitate quick material change.**
- **Available in four aperture sizes.**
- **Available with power supply and temperature controller.**
- **Complete assembly contained on a 35CF, 2.75" OD flange.**

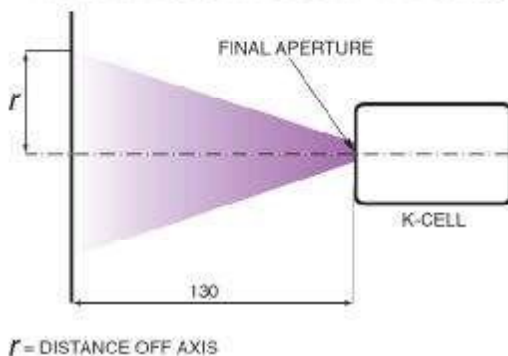


The Chell K-Cell utilises the principle of molecular effusion (demonstrated by Knudsen in 1909). Material to be deposited is heated to a suitable vapour pressure in an isothermal enclosure with an aperture in its wall. Molecular effusion occurs when the mean free path is large compared to the dimensions of the aperture. This gives rise to a cosine intensity distribution which can be collimated to form a beam of electrically neutral material. The advantage of this type of source is its ability to reproducibly deposit material with coverages ranging from sub-monolayer to continuous films. Chell has engineered these principles into a compact, self-contained cell, enabling the researcher to have a convenient, controllable deposition source. The furnace housing, which may be cooled by water or liquid nitrogen, is mounted together with the electrical feed through and the bellows-sealed shutter assembly on a 35CF (2.75"OD) flange. This arrangement allows the cell to pass down a 35mm bore tubulation.

The furnace of the K-Cell is designed as a removable cartridge which contains the crucible, heater element and heat shields. The crucible is heated by a Tantalum foil element which is isolated with Pyrolytic Boron Nitride (PBN) shields.

The central crucible is Graphite with an embedded thermocouple for accurate temperature measurement. The position of this thermocouple has been selected to follow the internal furnace temperature as accurately as possible. The design, developed by Chell's engineers, gives a stable high temperature furnace for controlled deposition of a wide range of materials. For maximum versatility a PBN liner may be fitted into the main furnace. Both the graphite and PBN crucibles are supplied with removable apertures to define and limit the output beam. Chell's unique cartridge design gives maximum flexibility to the user since complete cells of just the PBN liner can easily be replaced when the deposition of a different material is required.

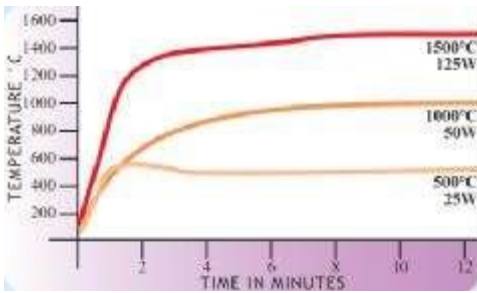
THEORETICAL INTENSITY vs RADIUS



| APERTURE SIZE | | | | |
|---------------|------|------|------|------|
| r | 1mm | 1½mm | 2mm | 3mm |
| 0mm | 100% | 100% | 100% | 100% |
| 1 | 94 | 96 | 97 | 98 |
| 2 | 87 | 91 | 93 | 96 |
| 3 | 80 | 87 | 90 | 94 |
| 4 | 74 | 82 | 87 | 91 |
| 5 | 68 | 78 | 83 | 88 |
| 6 | 61 | 74 | 78 | 86 |
| 8 | 50 | 65 | 73 | 81 |
| 10 | 38 | 57 | 67 | 77 |
| 15 | 13 | 37 | 51 | 65 |

Evaporation distance to specimen 130mm

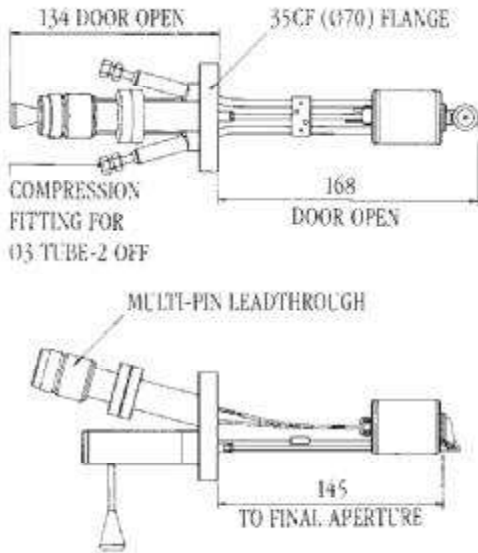
VFK-CELL - Power Supply



Since the characteristics of the heater element change with temperature both input power and temperature must be regulated. A microprocessor managed three term PID (Proportional, Integral, Differential) controller determines the power level necessary to reach and maintain the required temperature, within the specified limits. Changes in the cell temperature are simply achieved by changing the set temperature digitally displayed on the controller.

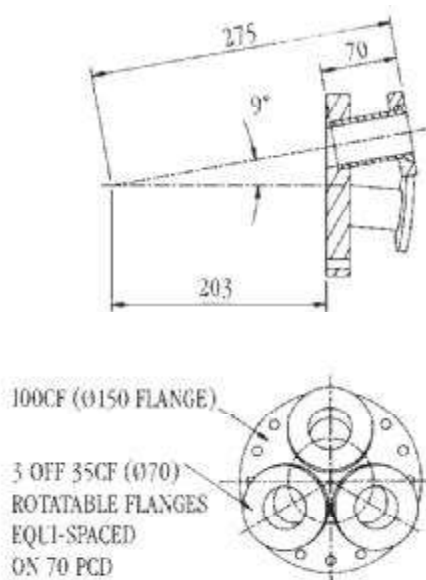


K-Cell - Dimensions



K-Cell - 3 Cell Flange Assembly

For studies where simultaneous or sequential deposition of different materials is required the Miniature K-Cell may be fitted in a group of three on a 100CF (6"OD) flange; in this configuration the cells target a common area 130mm from the shutter.



| K-Cell Specifications | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------|-------------------------------|
| | | Very Fine Grain Graphite | Pyrolytic Boron Nitride (PBN) |
| Crucibles | Density | 1.82 gms/cc | 2.15 gms/cc |
| | Open Porosity | 8% | 0% |
| | Capacity | 0.5cc | 0.4cc |
| It should be noted that nitrogen dissociates from PBN at high temperatures. Typical dissociation pressures: 2.4 x 10 ⁻¹⁰ mb N ₂ at 1200K, 4.1 x 10 ⁻³ mb N ₂ at 1800K | | | |
| Cooling | | Integral water or LN ₂ . Water flow requirement 0.25l/min | |
| Maximum operating temperature | | 1600°C | |
| Thermocouple | | Type R (Pt-Rh) 20 to 1600°C | |
| Apertures | | 1mm standard, 1.5, 2 and 3mm available | |
| Bakeout | | Bakeable at 250°C | |
| Heating | | Tantalum foil heating element insulated with PBN | |
| Power Supply Specifications | | | |
| Temperature Control | | Microprocessor managed three term PID control | |
| Heater Power | | Adjustable up to 250W | |
| Temperature Control Stability | | ±2°C or 0.3% (whichever is greater) | |
| Size | | 19" rack : 2U (425 x 470 x 85mm) | |
| Weight | | 10.5 Kg | |

| K-Cell Ordering Codes | |
|-----------------------|---------------------------------------------------------------------------------|
| KC3-BODY | Miniature K-Cell and shutter assembly |
| KC3-GRA-R | Graphite furnace cartridge with PtRh thermocouple (200 - 1600 deg C) (Standard) |
| KC3-GRA-K | Graphite furnace cartridge with K thermocouple (Option) |
| KC3-PBN | PBN liner and two apertures for graphite furnace |
| VFK-CELL | Power and Temperature controller for K-Cell with 4m connection lead. |