

## Dual Filament Effusion Cell



- Temperatures up to 1600 C
- Control of Thermal Profile of Cell
- Novel Thermocouple Design
- High Thermal Efficiency
- Robust, Reliable Design
- Fits Nearly all MBE Reactors

### Product Description

Many elements require a specific thermal profile to achieve the highest quality of films grown. Dual filament effusion cells have been in use for a number of years providing the ability to tailor the thermal profile of an effusion cell. These cells can be run in either hot or cold lip operation or with uniform heat by simply changing the amount of power to each filament.

One of the issues with MBE grown material has been the presence of oval defects in the films. One cause of this has been the condensation and re-evaporation of Ga clusters at the lip of the crucible. It has been shown that defects can be reduced by operating the tip of the cell at a higher temperature than the source material melt. This method of operation has been come to be known as “hot-lip” operation.

In hot-lip operation, the tip filament draws over 90% of the power used to heat the source material. This maintains the required higher temperature at the tip of the cell. When operating in this mode, users have seen a reduction of about an order of magnitude in the amount of defects seen in the films. For further reduction of defects, a new type of crucible is needed. E-science has developed the graphite based Titan crucible which has demonstrated extremely low defect densities. It is recommended that growers looking for higher performance than traditional PBN crucibles consider the Titan crucible as an alternative. Contact E-science for more information on this new crucible and effusion cell set.

Evaporation of aluminum has presented its own set of problems to MBE growers. One of the more common issues is the fact that aluminum will wet PBN crucibles. This causes aluminum to creep up the side walls of the crucible. In some cases, the aluminum will creep into the cell causing catastrophic damage to the cell. This effect is temperature related and users have been able to lessen the risk of material escaping the crucible by operating the cell in “cold-lip” mode.

In cold-lip operation, only the base filament is used resulting in a colder surface at the tip of the crucible. When the aluminum reaches the colder surface at the top it generally will not travel further up the wall protecting the effusion cell from damage. This provides a safer operation mode of the cell and helps to prolong the life of the campaign and the effusion cell.

Regardless of your application, the dual filament cell will be able to provide the performance needed to achieve high quality films. The cells can be designed to fit most commercial MBE reactors. Custom designs are also available. Refer to the selection chart on the back to find the correct model number for your system. For further performance enhancements, contact E-Science for more information on the Titan effusion cell and crucible set.

## Dual Filament Effusion Cell Selection Chart

E-Science provides effusion cells for all the major system manufacturers. In addition, E-Science can build effusion cells for other manufacturer's systems and for custom reactors. Please refer to the model number convention for ordering your specific effusion cell. Contact E-Science for more information.

### Varian / Intevac / EPI / Veeco MBE Reactors

2" Gen II	3" Gen II, Gen III or Gen20	Gen200	Gen2000
16cc = EC-016-275-1140-DF 40cc = EC-040-275-1140-DF	60cc = EC-060-450-1140-DF 125cc = EC-125-450-1140-DF	200cc = EC-200-600-1250-DF	700cc = EC-700-800-1250-DF

### Riber MBE Reactors

32P	Compact 21	48 / 49	6000 / 7000
25cc = EC-025-275-1116-DF 35cc = EC-035-275-1116-DF	60cc = EC-060-450-1250-DF 125cc = EC-125-450-1250-DF	500cc = EC-500-600-1500-DF-L	700cc = EC-700-800-1300-DF-L

### VG Semicon / Oxford MBE Reactors

V80	V90	V100	V150
30cc = EC-030-450-1285-DF-L 85cc = EC-085-450-1285-DF-L	85cc = EC-085-450-1150-DF-L	200cc = EC-200-600-1150-DF-L	700cc = EC-700-800-1890-DF-L

### Model Number Convention

Model # = A - B - C - D - E - F

A = EC for Effusion cell

B = Capacity (in c.c.'s)

C = Flange Size

- i. 275 = 2.75" CF Flange
- ii. 450 = 4.5" CF Flange
- iii. 600 = 6.0" CF Flange
- iv. 800 = 8.0" CF Flange

D = length (in inches \* 100)

E = Type = DF for Dual Filament

F = L for water cooled (if required)

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