e-flux

Mini Electron Beam Evaporator

e-flux Power Supply

The e--flux Mini E-Beam Evaporator is an evaporator for small and medium quantities of almost any material in the temperature range of 400K to 3100K. Evaporation is possible either directly from evaporant in rod form (Ø2-6mm) or out of a crucible.

An integrated optional flux monitor allows maximum deposition control. Highly efficient water-cooling ensures negligible outgassing during operation.

The e-flux is very compact and mounted on a CF-35 flange (2.75"OD). It can easily be retrofitted to existing UHV systems as the mounting orientation is virtually unlimited.

Main applications are in surface science, thin films and doping.

KEY FEATURES AND BENEFITS

- Evaporation of almost any material
- Simple, rugged construction using only standard feedthroughs
- Different crucible materials available (Mo, Ta, W, Graphite)
- Motorized rod feed option
- Dual mode operation from rod or out of crucible (e-beam heated effusion cell)
- Flux controller available
- Liner Material Options (BN, Quartz, Alumina)
- Optional Ion Trap to deflect charged particles

Description

A coiled tungsten filament (ground potential) is placed in the immediate vicinity of an electrically conducting crucible or target (high positive potential) and provides electrons which are accelerated towards the evaporant rod/crucible producing extremely high Heating-power densities. The evaporation hearth is highly efficient water-cooled to ensure Negligible outgassing.

The construction of the e-flux Mini E-Beam Evaporator is rugged for long term trouble free Operation. Only standard feedthroughs are used even for the water-cooling lines and the rod feed to minimize downtime and enabling the user to self-service in case this should be Necessary.

The filament can easily be replaced and can be self-made using standard Tungsten wire. The power supply is a conventional, rugged design which delivers up to 600W to allow Even medium quantities of material to be deposited (>1nm/s). However, fine control of the emission current makes evaporation of very low rates (<0,01A/s) easy and reproducibly Possible.

Due to the 600W power supply evaporation of Ø2mm and up to Ø6mm rods are possible. Besides the increased evaporation rates this also allows higher quality films. As the homogeneity of thin films is improved with larger distance, the disadvantage of lower Deposition rates can therefore easily be compensated.

The e-flux can be tailored to almost any application using a wide range of options such as Flux monitor, flux controller, shutter, extended rod feed, ion trap option and many crucible materials.

Modes of Operation

This evaporator can be used to evaporate material in two ways:

- *e-beam evaporator mode*

The material in rod form is directly bombarded by electrons and rises rapidly to evaporation temperature. Rod evaporation is generally preferable because it creates purest films (only evaporant is heated), no crucible employed (no crucible cost, no alloying) and evaporation from all direction possible. However, some materials such as those with high thermal conductivity and low melting points need crucible evaporation (below). Rod evaporation is suitable for refractory metals and other materials which reach high partial pressures e.g. 10-1 Torr before melting. As material is evaporated, more can be fed into the evaporation zone, using the linear motion feedthrough.

- *effusion cell mode*

The material is placed in a conducting, usually refractory metal crucible which is heated by electron bombardment causing the contents to evaporate. The effusion cell mode is intended for insulators or other poor electrical conductors and low vapor pressure Materials such as Gold and Aluminum which melt before reaching useful vapor pressures.

Additional Features

This e-beam evaporator/e-beam heated effusion cell provides a number of features and advantages over previous designs:

- The power supply is constructed using simple and rugged technology which permits high electron beam powers up to 600W standard to be generated without the use of Complex failure-prone electronics.

- The filament is a small coil consisting of several turns of tungsten wire as opposed to 'Hairpin' and short-wire filaments. Because the filament fully surrounds the target, more Uniform e-beam heating with consequently improved flux distribution can be achieved. Replacement filaments are readily fabricated from tungsten wire and easily exchanged Thereby minimizing operating costs.

- Only standard feedthroughs are used to minimize servicing costs and downtime in case Of eventual failures. The water-cooling lines are flange mounted (CF16, 1.33"OD). The rod feed driven by a conventional linear motion feedthrough found in most vacuum components catalogues.

- A flux monitor is available. This is an additional electrode which intercepts the edge of The emerging vapor beam. As the vapor leaves the crucible/rod it is partially ionized by the incoming electron beam. Some of the ions will be collected by the flux monitor electrode, generating a small positive current which is related in magnitude to the vapor flux.

- Besides flux monitor a flux controller (PID) is available to keep the flux automatically constant.

- The large electron emission surface provided by the tungsten coil filament allows higher e-beam powers to be used at lower filament temperatures than in short filament Designs, with consequently extended filament lifetime. The filament is simple in form. Replacements may of course be purchased or be easily fabricated by the user from Tungsten wire.

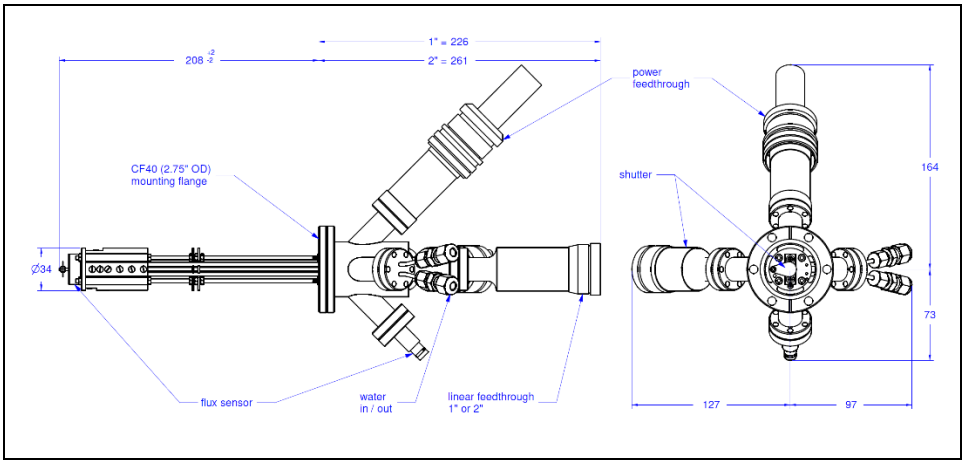
- The higher e-beam powers available (600W) mean that rods with larger diameters (up To 6mm) may be evaporated. This in turn means that higher evaporation rates can be obtained because of the larger evaporation area and that more material may be evaporated before refilling is required. Further, as films with highest homogeneity are achieved at larger distances the much higher evaporation rates enables best film quality.

- The design of the evaporator allows rods of up to 50mm in length to be fed into the Evaporation zone.

- The ion trap option allows to deflect all charged particles out of the beam avoiding residual ions to affect the generated thin film.

SPECIFICATION

Dimensions



Technical Specification

In vacuum length	195 mm for 25 mm rod feed version (without options)
	255 mm for 50 mm rod feed version (without options)
Max in vacuum diameter	34 mm
Mounting Flange	CF35 (2.75" O. D.)
Bakeout temperature	Max. 200°C
Standard rod diameter	2 mm (standard), up to 6 mm possible
Crucible volume	0,3 ccm (standard)
Deposition rate	From < 0,01 Å/s to > 2 nm/s
Beam divergence	±15°, ±12° with flux monitor (typical)
Standard rod feed length	25 mm
Deposition rate	From < 0,01 Å/s to > 2 nm/s
Beam divergence	±15°, ±12° with flux monitor (typical)

Power Supply

Power	230 VAC / 50 Hz (Standard)
	115 VAC / 60 Hz or 100 VAC / 50 Hz (to be stated with order)
Size	19" rack mount, 3U height
e-beam power	Max. 600 W

Options

Shutter	Manual, motorized
Flux	Flux Monitor, Flux Controller
Feed	Motorized rod feed
Trap	Ion
Extended feed length	50 mm

Please contact us for more Information.
We and our team behind us will be happy to help you!

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