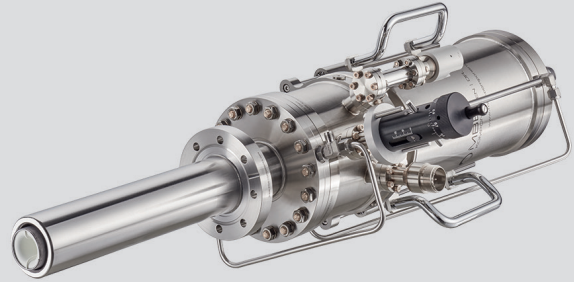


VALVED CORROSIVE MATERIAL CRACKER SOURCE VCCS

- Evaporation and cracking of Sb, Te, Mg, CdTe and other corrosive materials
- Large crucible capacity of 420 cm³
- All-PBN construction of valve and cracker
- Stable and reproducible flux control
- Easy installation and refilling procedure



VCCS 100-420 mounted to water-cooled VADP 100-63-K adapter with DN63CF (O.D. 4.5") mounting flange



Additional equipment for the VCCS (motorized valve control unit MVCU with temperature controllers, power supplies and cables)

The Valved Corrosive Material Cracker Source VCCS was developed for controlled injection of molecules and radicals of antimony, tellurium, magnesium or other corrosive materials in standard MBE applications. Parts directly exposed to the evaporant, like crucible, valve mechanism, injector tube and cracker, are solely made from PBN to minimize corrosion of the cell.

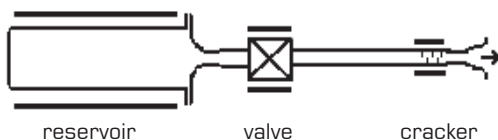
A mixture of larger molecules of, for example, Sb_n is produced by sublimation of the evaporant within the reservoir. The resulting beam flux is controlled by an all-PBN mechanical valve unit and finally the gaseous molecules may be dissociated within the thermal cracker stage to form a well-defined molecular beam, e.g., of more reactive Sb₂ species.

The source consists of the 420 cm³ reservoir, built into a water-cooled vacuum enclosure that also houses the valve unit, and the injector tube with a thermal cracker unit on top.

Operation of the mechanical valve unit features fast, stable and reproducible flux control. Together with the valve controller MVCU an easy handling and integration into your MBE system is provided.

Three independent heater circuits allow precise and flexible adjustment of the temperatures in each part of the cell in order to provide sufficient material vapor, avoid condensation within the valve or injector tube and ensure maximum cracking efficiency, each according to the requirements of the particular evaporant.

The special design enables easy and safe refilling of the crucible from the backside of the cell without the need of removing the complete cell from the system.



Schematic drawing of the VCCS all-PBN assembly of crucible, valve and cracker, surrounded by three independent heaters

Applications

The main purpose of the VCCS in MBE applications is enhanced flux control and cracking of materials that are highly corrosive as a vapor. It was originally designed as a source for an antimony radical (Sb_2) molecular beam as group V material in standard III-V MBE. The VCCS is also used for CdTe solar cell layer deposition. The all-PBN construction of the inner parts, the valve mechanism in particular, in combination with the flexibility provided by three independent heater circuits allows also the use of other materials like Te, Mg or Se with the VCCS. The large crucible capacity of 420 cm³, fast and precise flux control and easy handling for maintenance and crucible refill make the VCCS an ideal source for smaller production MBE systems as well as for higher throughput research MBE systems.

Adapter VADP

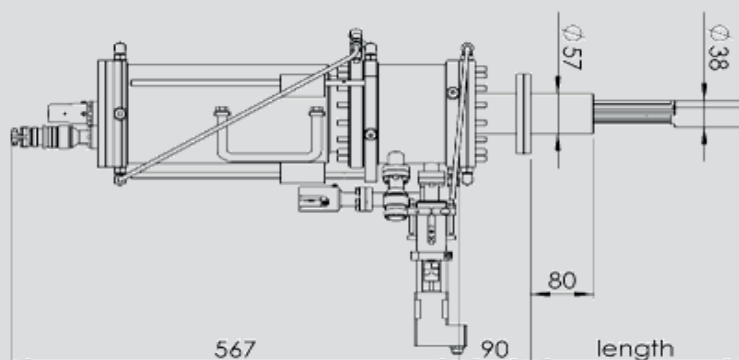
A VADP adapter connects the valved source to the MBE chamber. Design and dimensions will be customized according to your MBE system. The VADP is available with or without integrated water cooling shroud.

Motorized Valve Control Unit MVCU

The Motorized Valve Control Unit MVCU is designed for operating the valve of a valved source with a stepper motor drive. Manual or remote control with 0-10 V analogue input signal is possible. The display indicates the linear position of the valve from 0 - 7.99 mm from fully closed to fully open position. The stepper motor drive has a resolution of 0.01 mm/step and a motor speed of 1 mm/s. The automatic zero calibration guarantees highly reliable and reproducible operation of the valve unit. The MVCU housing is compatible with the 19" rack system.

Technical Data

Mounting flange	DN100CF (O.D. 6") with VADP adapter DN40CF (O.D. 2.75") or DN63CF (O.D. 4.5")
Dimensions in vacuum	depend on used VADP adapter and cracking insert
Heating system	cell / valve / cracker: 3 separate Ta-wire heaters
Thermocouple	cell / valve / cracker: 3 type C thermocouples (W5%Re/W26%Re)
Bakeout temperature	max. 250°C
Outgassing temperature	cell crucible: 800°C; valve: 900°C; cracker: 1300°C
Operating temperature (for Sb)	cell crucible: 550-650°C; valve: 600-700°C; cracker: 650-1200°C
Cooling	integrated water cooling shroud
Flux control	integrated all-PBN valve mechanism / cell temperature
Valve control	stepper motor drive with control unit MVCU
Crucible	420 cm ³ (PBN)



Schematic drawing of the Valved Corrosive Cracker Source VCCS
 (Drawing shows VCCS 100-420 mounted to VADP 100-63 adapter with DN63CF (O.D. 4.5'') mounting flange)