Valved Source for Corrosive Materials - VCOR

Sb, Zn, Mg, Te, Se, S, CdTe, ZnTe, ZnSe,…

- **Performance, flexibility, reliability**
- **Highly reproducible flux control**
- **Large dynamic range & closed-to-open valve ratio**
- **From 110 to 3000 cm3 real loading capacity (0,7 to 19 kg of antimony)**
- **Full PBN reservoir and valve for highly corrosive and high vapor pressure materials**
- **Simple charge loading (no valve dismantling)**

Product introduction

The Riber valved source for corrosive materials, model VCOR, is a compact valved source dedicated for corrosive or high vapor pressure material evaporation. The 110 to 3000 cm3 loading capacity is fully exploited by the use of cylindrical charges; chunks or pellets can obviously also be used.

A valve mechanism allows rapid and accurate flux adjustments over more than a decade and shuts off the flux over more than 3 orders of magnitude by simply rotating the thimble.

Both the reservoir and tip filaments may be heated independently. This enables heating of the vapor outlet while avoiding any material clogging.

Reservoir and tip thermocouples are embedded within the oven assembly to allow loading without disconnecting feedthroughs. The loading operation only requires the replacement of a CF63 gasket; the reservoir can be unmounted and loaded with materials, when the valve part remains attached to the growth chamber.

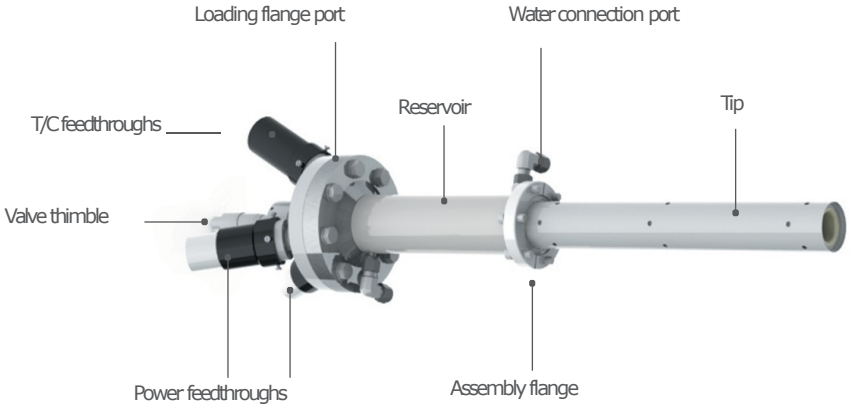
The all-PBN valve avoids the use of Tantalum or other metals in the path of the process vapor. The outside body of the source is water cooled to reduce overheating. The valve is operated with an automated position controller enabling a highly reproducible flux control, intra-day and from day to day.

This controller is also equipped with a patented ProSafe® test for safe operation, enabling a perfectly adapted valve torque , ensuring leak tightness of the PBN valve while preserving the PBN surfaces from excessive stress.

VCOR design ensures an excellent mixed group V composition & uniformities for Sb applications, but also demonstrate very high capability for Mg doping or ZnSe laser facets passivation.

Thanks to its compact design, it can easily be adapted to a large range of MBE systems.

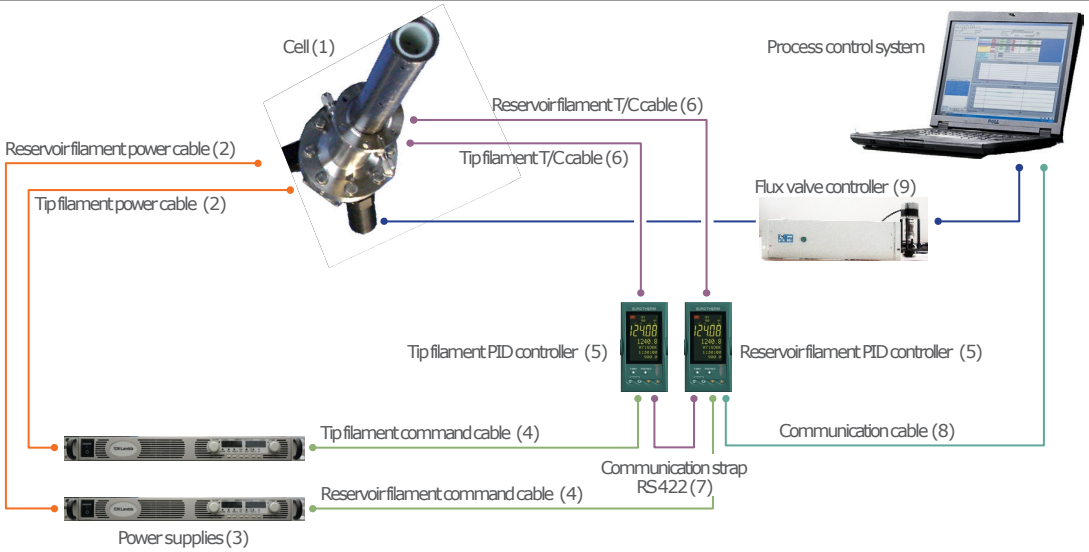
Layout



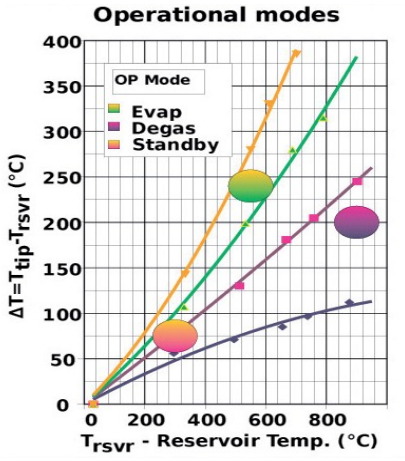
Specifications

Cell characteristics	VCOR 110	VCOR 300	VCOR 3000
Filaments	Two		
Heating filaments	Wire		
Thermocouple	Double C-type		
Crucible/valve material	PBN/PBN		
Useful capacity	110 cc (Ø20 x 350mm)	280 cc (Ø31 x 370mm)	2 950 cc (Ø95 x 417mm)
Mounting flange	CF 40 (CF63 with water panel)	CF 63 (CF100 with water panel)	CF 150 (CF 200 with water panel)
Reservoir typical operating temperature	450 – 550°C		
Tip typical operating temperature	750-900°C		
Temperature stability	±0.3°C	±0.1°C	
Valve Characteristics			
Open conductance	2 l/s	10 l/s	85 l/s
Open / close ratio	>1000		
Valve actuator	Micrometer		
Stem stroke	2 mm – 4 revolutions	2.5 mm – 5 revolutions	5.1 mm – 8 revolutions
Tip Characteristics			
Max outgassing temperature	1000°C		
Power consumption (Tip @1000°C)	280 W	200 W	880 W
Reservoir Characteristics			
Loading port	CF 63	CF 100	CF 200
Max outgassing temperature	750°C	750°C	1000 °C
Power consumption (Reservoir @ 750°C)	500 W	450 W	2200 W
Water flow	0.3 l/min – 4 bars max		1.5 l/min – 4 bars max

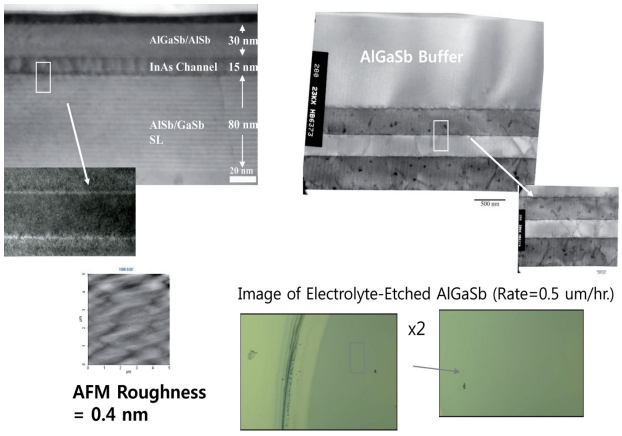
Component interfacing



Results

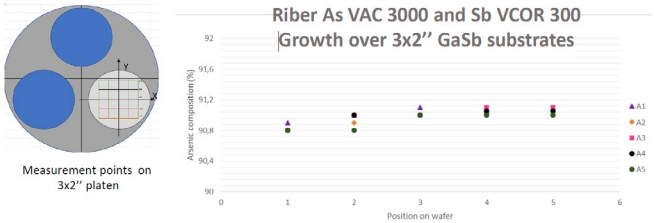


With the unique design of the heaters, a wide temperature differential can be kept between the tip and the reservoir. This ensures the achievement of optimum working conditions for different material evaporation.
The achievable temperature gradient between tip and reservoir is shown in the plot which demonstrates the flexibility of the Riber VCOR source.



Growth of a metamorphic HEMT structure on Si(001) substrate. The surface morphology is excellent with a very low defect density. InAs/AlGaSb FET on Si(001) shows room temperature electron mobility of 16,000 cm2/V-s with a low defect density.

(Courtesy of Prof. Jae-Eung Oh / K.-M. Ko, Nanotech. 20 (2009))



High As content layer (91 % As –9 % Sb) InAsSb measured by HRXRD

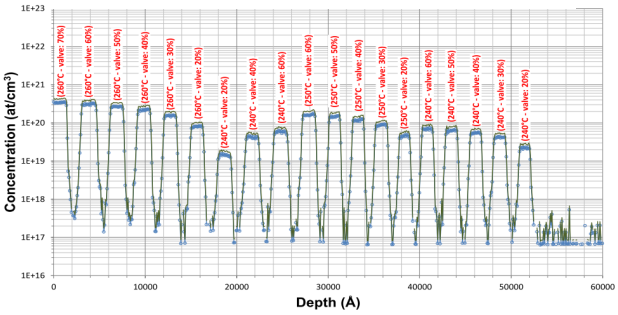
As and Sb composition uniformity: ±0.12%

Courtesy of IES, Montpellier, France

SIMS Calibrations : [Mg] Concentration in GaN:Mg depending on VCOR reservoir temperature and valve opening

Abrupt interfaces, constant concentration (no Mg segregation), Mg residual doping of about 1x1017 cm-3 for separating layers of GaN undoped
Courtesy of CRHEA (June 2017)

Results obtained in a RIBER Compact 21T MBE chamber



CELLS & COMPONENTS – Valved source for corrosive materials - VCOR

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