

Valved Cracker Cell for Arsenic - VAC

- More than 200 in operation
- Flux modulation reproducible within 1% with great valve dynamic response for total control of the growth
- Excellent flux uniformity for superior epiwafer quality
- Fast and precise on/off control over arsenic BEP
- Extended lifetime before refilling
- Rugged and reliable



Product introduction

The Riber valve cracker consists of three main parts : the reservoir, the isolation valve and the cracker stage.

In addition to providing users with a large capacity arsenic source for increased system uptime, the valved cracker cell enables precise control over small or large variations in BEP with rapid shut-off capability. As well as easily isolating the bulk material from the epitaxy chamber, it also enables growth of advanced stacked structures, previously impossible to obtain using conventional MBE sources.

Vapor deposition with a VAC is the result of a Multiple Input Single Output structure base control :

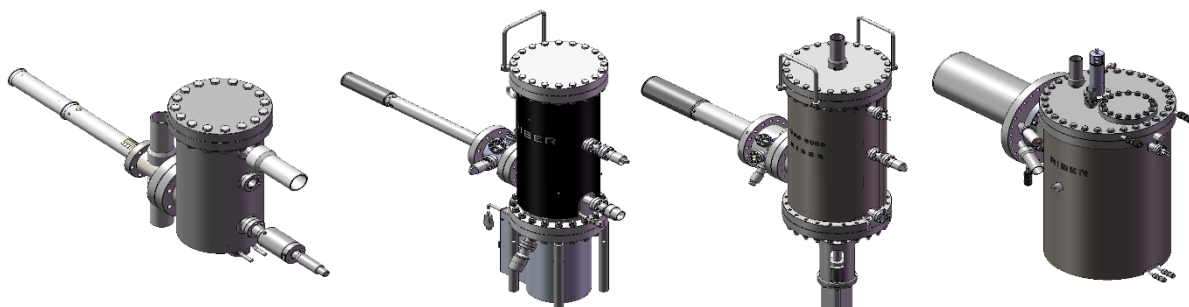
- 1st Input : The reservoir temperature controls the vapor pressure of metal in the crucible

- The crucible temperature determine the build up of vapor pressure in the crucible
- The crucible temperature stability warranty that the deposition rate is constant at a given valve opening
- 2nd Input : The valve controls the conductance of the source
- For a given crucible temperature, the valve allows, to adjust the deposition rate over 3 decades
- For a given crucible temperature, the reproducibility of the valve position in Opening / closing cycles allows the reproducibility of deposition rate in the process.

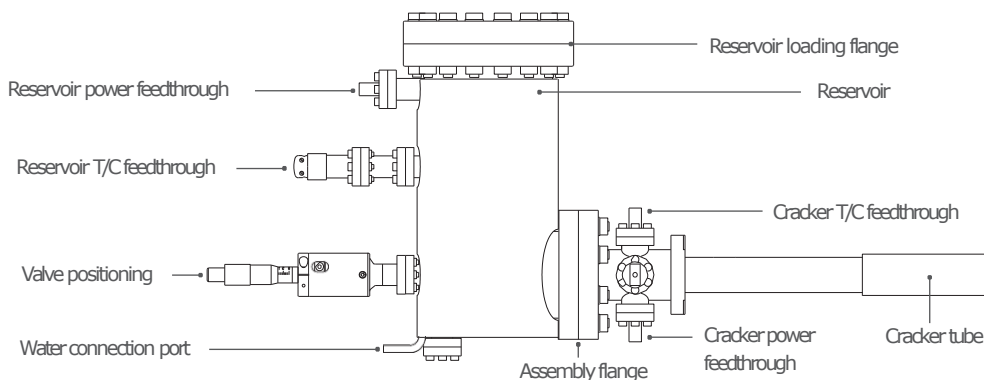
Solid arsenic is loaded through a CF port into the reservoir crucible. The reservoir is externally water cooled for an efficient heat dissipation.

The metering valve is located downstream of the crucible, allowing exact control of the amount of As₄ entering the feeding tube. This design allows the valve to operate at low temperatures and since it is thermally isolated from the cracker section, immediate start-up and long-term flux stability is achieved even if the cracker temperature is cycled. This valve is operated with an automated position controller.

The evaporated As enters a feeding tube and cracking zone where tantalum filaments resistively heat both assemblies. The cracker stage generates beams of cracked or uncracked material. Geometry of the diffuser has been optimized to provide a uniform flux on the substrate.



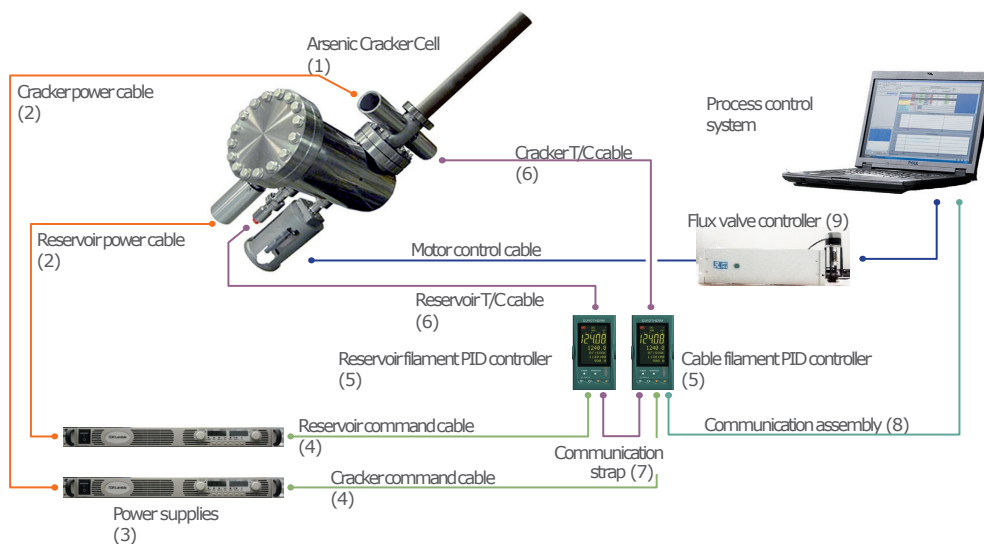
Layout



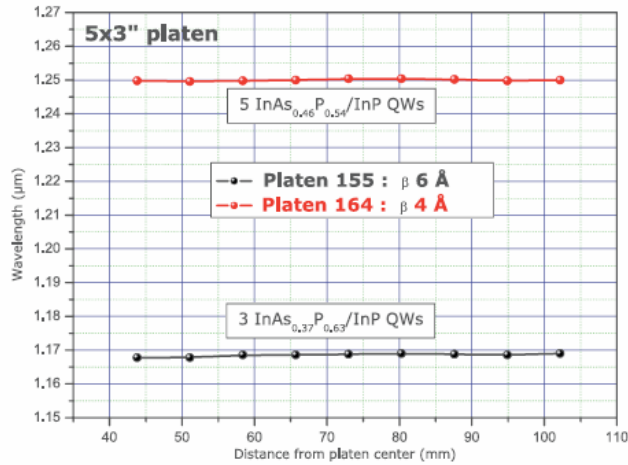
Specifications

Cell characteristics	VAC 500	VAC 3K	VAC 6K	VAC 20K
Filament	Two	Two	Two	Two
Heating filaments	Wire	Flat + Wire		Wire
Thermocouple	Double C-Type			
Useful capacity (Max load dimensions cc)	500	2 900	6 000	20 000
Mounting Flange (min)	CF 40 (2" 3/4)	CF 63 (4" 1/2)	CF 100 (6")	CF 250 (12")
Reservoir typical operating temperature	400°C			
Cracker typical temperature	650°C - 950°C			
Temperature stability	+/- 0.2°C			
Valve characteristics				
Valve actuator	Micrometer drive			
Stem Stroke	1.5mm (3 revolutions)	10 mm	2 mm (4 revolutions)	5.1 mm (8 revolutions)
Cracker Characteristics				
Max outgassing temperature	1250°C			
Power consumption	300W max	400W max	1200W max	2200 W max
Reservoir Characteristics				
Fill port diameter	68	120	160	76 internal
Max outgassing temperature	550°C			
Power consumption	300W max	570W max	640 W max	980 W max
Water connection	Swagelok fitting Ø 6 female			
Water flow	Min. flow 0.5l/mn 7 Bar max			Min. flow 1l/mn 4 Bar max

Component interfacing



Results



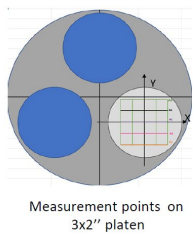
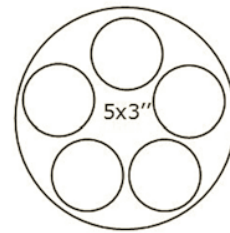
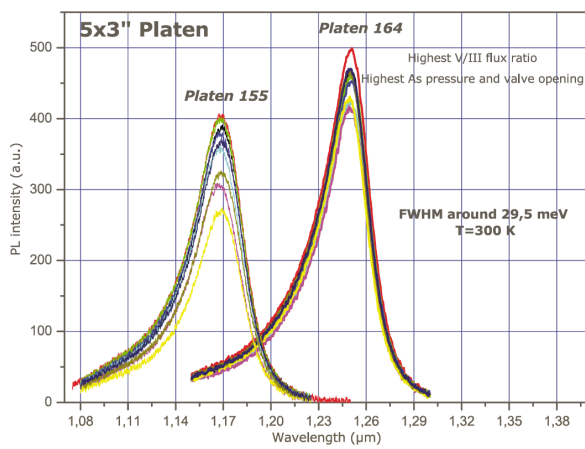
Outstanding InAs_xP_{1-x} Compositional Uniformity

Through the growth of InAsP/InP multi-quantum wells, Ribier application laboratory demonstrates the excellent uniformity profile of the KPC1200 & VAC 3000

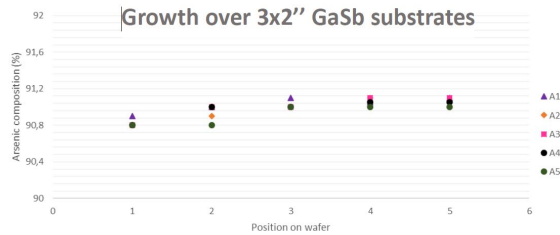
Photoluminescence spectra of InAsP/InP multi quantum wells.

Composition of the InAsP quantum well is highly dependent on the As/P flux ratio and on the substrate temperature over the platen.

±4Å for the optimal V/III ratio, corresponding to a As/P composition variation of ± 0.05%



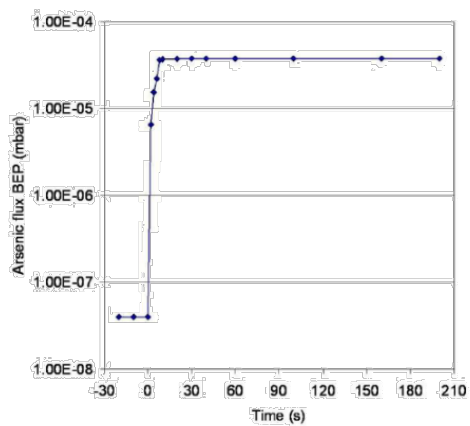
Composition uniformity Ribier As VAC 3000 and Sb VCOR 300 Growth over 3x2" GaSb substrates



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

As and Sb composition uniformity: ±0.12%

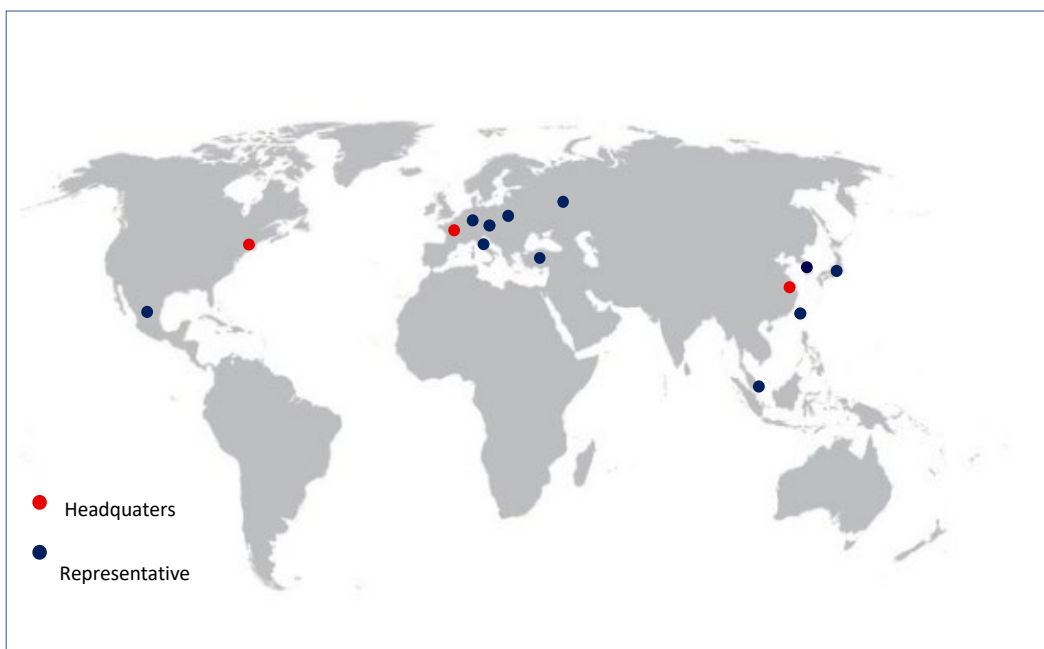
Courtesy of IES, Montpellier, France



Rapid valve response from closed to fully open position
Note the high BEP obtainable-plenty to enable high-rate growth processes

RIBER SALES AND SERVICE NETWORK

For more information, please contact your local sales representative



FRANCE
 RIBER
 31, Rue Casimir Périer
 95 873 Bezons Cedex
 France
 Tel : +33(0)1 3996 65 91
 Fax : +33(0)1 3947 4562
 Email : customerservice@riber.fr

USA/CANADA
 RIBER Inc
 216, Route 206, Suite 17
 Hillsborough
 NJ 08844 USA
 Tel : +1 732 603 0680
 Fax : +1 732 603 8611
 Email : customerservice@riber-us.com

CHINA
 RIBER China
 Room 1-8, Building A, Dart Tech Park
 #516 Wenchuan Road, Baoshan District
 Shanghai PR China
 Tel : +86 (21) 635 66 266
 Fax : +86 (21) 635 66 266
 Email : customerservice@riber.cn

OTHER COUNTRIES
 RIBER
 31, Rue Casimir Périer
 95 873 Bezons Cedex
 France
 Tel : +33(0)1 3996 65 91
 Fax : +33(0)1 3947 4562
 Email : customerservice@riber.fr

Email: info@riber.com

Website: www.riber.com