

Heated insert cell for Ga & In - ABI

- Large loading capacity from 85cc to 3000cc
- Higher stability than any other effusion cell
- Lowest growth defect density compared to any other effusion cell
- Wafer growth uniformities improved by factor of up to 3
- Reduced flux transient
- Reusable insert



Product introduction

The Riber ABI effusion cell is designed to produce stable purity molecular beams.

The ABI cell relies on the concept of a cylindrical crucible with a self-heated beam-shaper insert on top. This unique design enables extended campaign durations - 4 times higher loading capacity than conventional conical crucibles and large ingot loading (reduced source material oxidation and increased material quality).

It is specifically adapted for the growth of epitaxial layers of medium vapor pressure materials.

ABI cells perform with a very high reproducibility, with excellent run-to-run stability and long-term flux

stability - less than 1% variation over 40 h

ABI give improved epilayer quality compared to standard conical cell, with best in class uniformity - better than 1.5% - and low defects density. The flux transient is also reduced to less than 2%.

The insert has been carefully engineered to improve the flux stability over the load consumption, while maintaining excellent uniformities of thickness and composition. The design also enables to get the same evaporation surface over time. The insert is reusable.

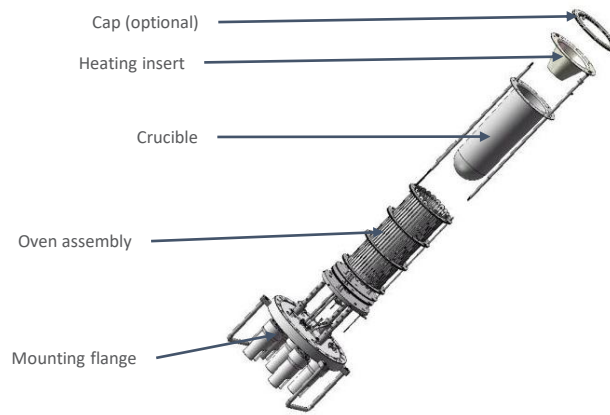
It is heated on the conical section and on the lip in order to prevent condensation and droplet formation or cross contamination, thus reducing

“oval defects” observed in GaAs growth with other technology.

Flexible operating conditions are obtained with independent temperature control of the insert filament.



Layout

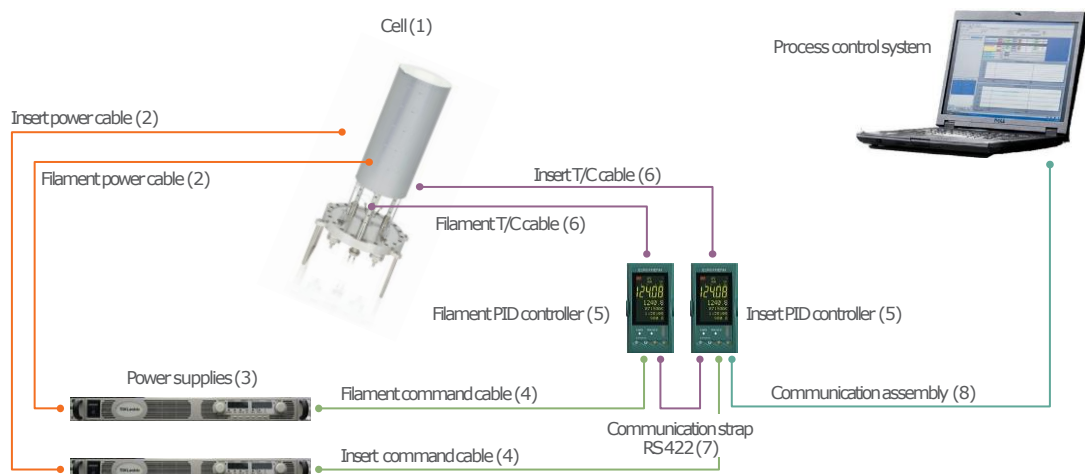


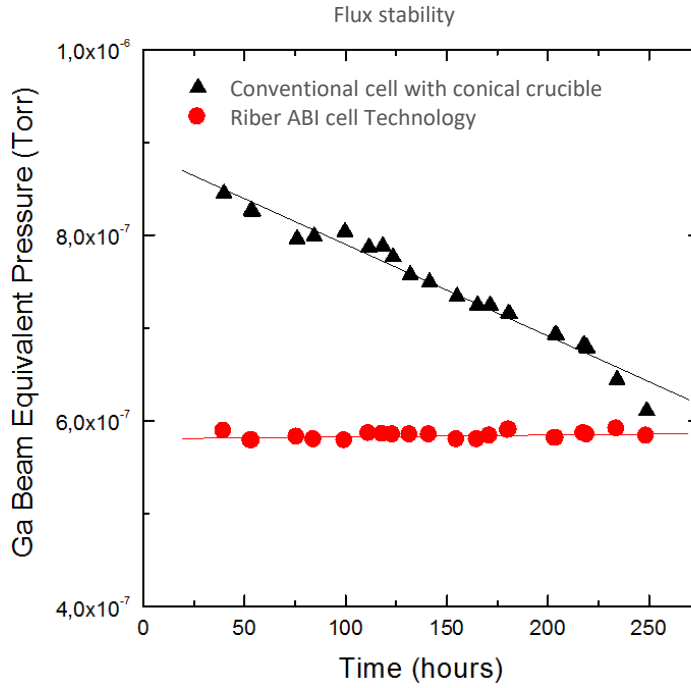
Specifications

Cell characteristics	ABI 85	ABI 500	ABI 800	ABI 1000	ABI 3000
Filament	One	One	One	One	One
Heating zone	Two	Two	Two	Two	Two
Heating filament	Ta wire	Ta flat heater	Ta flat heater	Ta flat heater	Ta flat heater
Heated insert	PG resistive track encapsulated in PBN	PG resistive track encapsulated in PBN	PG resistive track encapsulated in PBN	PG resistive track encapsulated in PBN	PG resistive track encapsulated in PBN
Insert Thermocouple	1 x C-type	2 x C-type	2 x C-type	1 x C-type	1 x C-type
Crucible thermocouple	1 x C-type	2 x C-type	2 x C-type	1 x C-type	1 x C-type
Crucible	PBN	PBN	PBN	PBN	PBN
Mounting flange	CF63	CF100	CF100	CF150	CF200
Typical operating temperature (Ga @ 1 µm/h) - insert / crucible*	insert: 1000°C / crucible : 950°C	insert: 1050°C / crucible : 950 °C	insert: 1050°C / crucible : 950 °C	insert: 1050°C / crucible : 950 °C	insert: 1000°C / crucible : 950 °C
Max. outgassing temp. (empty cell) - insert / crucible*	Refer to QCS	Refer to QCS	Refer to QCS	Refer to QCS	Refer to QCS
Temperature stability	< ± 0.5 °C	< ± 0.5 °C	< ± 0.5 °C	< ± 0.5 °C	< ± 0.5 °C
Water / Gas / Electrical					
Power consumption crucible (Ga 1 µm/h)	140 W	300 W	500 W	600 W	1100 W
Power consumption for insert (Ga 1 µm/h)	230 W	400 W	1000 W	1600 W	2800 W
Max. Current in Insert	Refer to QCS	Refer to QCS	Refer to QCS	Refer to QCS	Refer to QCS
Crucible - Power supply	60 V - 12.5 A	GEN 150 V-16 A 1U 1P	GEN 150 V-10 A 1U 1P	Alim GEN100 V-24 A 1U 1P	GEN 400 V - 25 A 3U 3P
Insert - Power supply	60 V - 12.5 A	GEN 80 V-30 A 1U 1P	GEN 80 V-30 A 1U 1P	Alim GEN100 V-24 A 1U 1P	GEN 200 V - 25 A 2U 3P
Power output connector	1 x SPC-4	1 x SPC-4	1 x SPC-4	4 x RTMI	2 x SPC-2+
Thermocouple connector	2 x HMPW-C-N	4 x HMPW-C-N	4 x HMPW-C-N	2 x HMPW-C-M	2 x HMPW-C-N
Integrated water cooling*	On request	On request	On request	On request	Flange cooling
Water connection*	SS-4M0-6	SS-4M0-6	Contact Riber	SS-4M0-6	SS-10M0-6-8M
Power Cable	1 x Cord Cell BK-SW-Ø8-8-23-SPC-2 1 x Cord Cell BK-WTL-Ø8-8-23-SPC-2	1 x Cord Cell BK-SW-WTL-Ø 8-11-23-SPC-4	1 x Cord Cell BK-SW-WTL-Ø 8-11-23-SPC-4	1 x Cord Cell BK-WTL-Ø 8-11-55-WTL-Ø 6	2 x Cord BK-WTL-Ø 8-46 A-SPC2-CF35
Thermocouple cable	2 x Cord cell BK-HMPW-C-F-11-C	2 x Cord cell BK-HMPW-C-F-11-C	2 x Cord cell BK-HMPW-C-F-11-C	2 x Cord cell BK-HMPW-C-F-11-C	2 x Cord Th BK-HMPW-C-F-11

*For some versions and systems adaptations, water cooling may be necessary

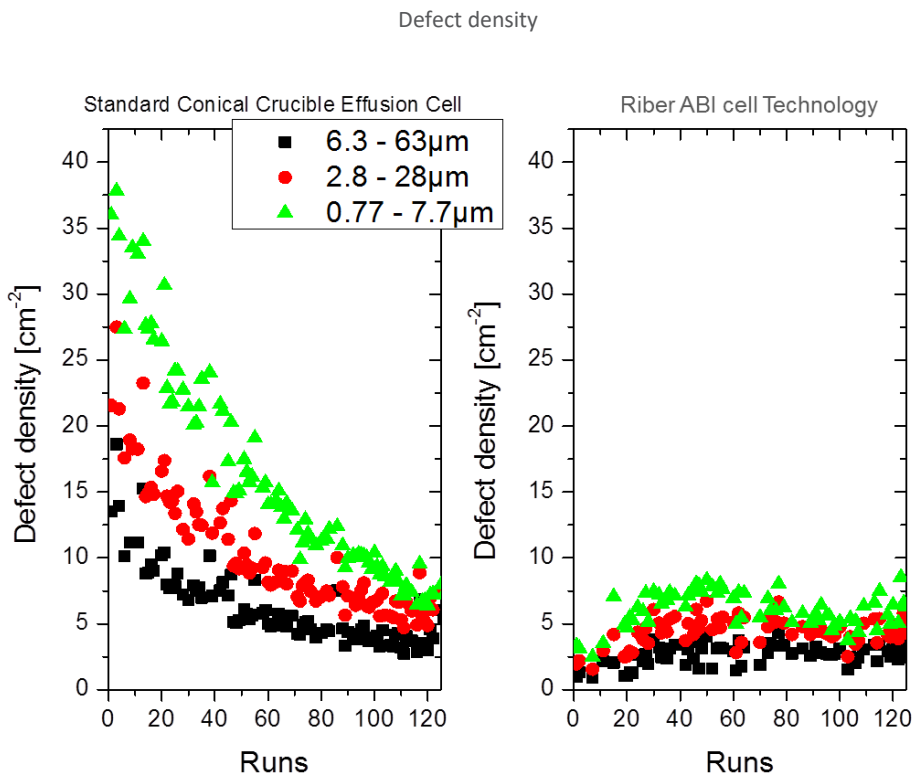
Component interfacing





The ABI technology demonstrates unprecedented flux stability over time, eliminating calibration routines, as materials depletes as in conventional conical cells.

Growth rate variation as low as +/- 0.3% has been observed over 200 runs with ABI1000. Measurements were performed by X-Ray on an AlGaAs/GaAs superlattice structure.

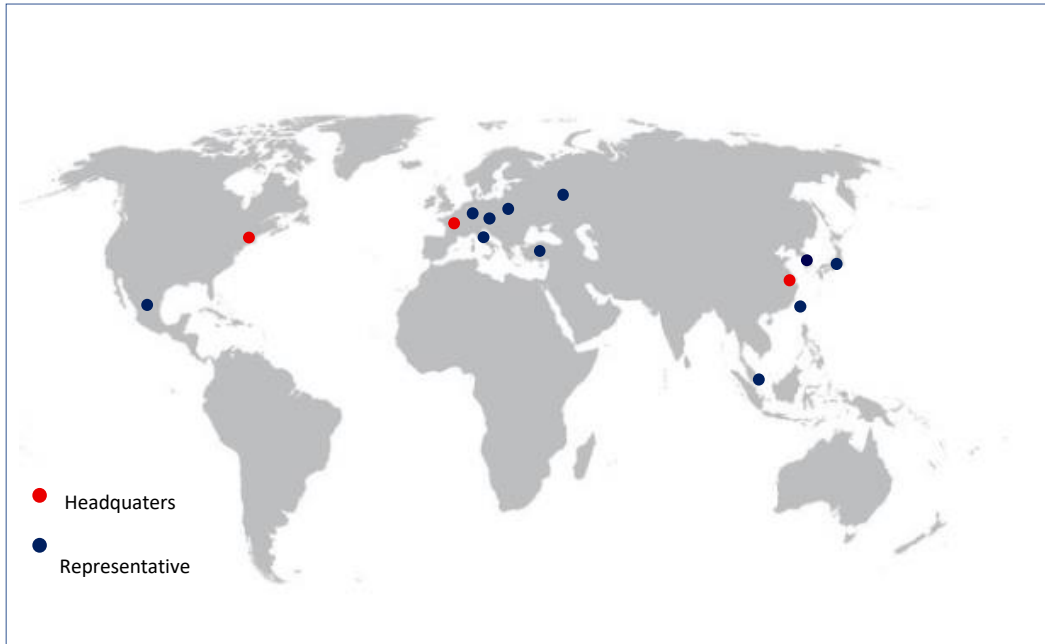


The ABI reduces significantly the density defects on multi wafer production system. The defect density reaches the lowest level at the beginning of growth campaign.

The ABI offers a solution to improve the production throughout the machine, reducing calibration wafers, decreasing the rejection of wafer due to out of specs defect density, increasing campaign duration by its loading capacity.

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