

CELLS AND SOURCES

THE LARGEST RANGE OF BEAM GENERATORS FOR MBE

More than any other component, **Cells and Sources** play a key role in the quality of materials grown by MBE (i.e. morphology, purity, composition, uniformity, etc.). With over 10.500 MBE sources in the field, Riber has the largest installed base. Our experience in high-quality components and years of close cooperation with leading research and production groups has brought Riber to the forefront of MBE source technology.



EFFUSION CELLS

MASTER SOURCE : MS

The Master Source benefits from MS technology which consists of **a specific crucible design** combining high performance with **low operating and maintenance costs**. **The ultra-pure beam** of stable flux is a result of the MS crucible concept.



THERMACELL SERIES : ABI

The Ribier Thermacell ABI insert effusion cell is designed to **produce stable purity molecular beams**. The ABI cell relies on the concept of a **cylindrical crucible with a beam-shaper insert** on top. The cylindrical crucible allows for **higher load** compared to standard conical crucibles. It is specifically adapted for the growth of epitaxial layers of **medium vapor pressure materials**. The insert has been carefully engineered to improve the flux stability over the load consumption, while maintaining **excellent uniformities of thickness and composition**.



MM TECHNOLOGY : DZ-MM

The MM technology is specifically used for **the evaporation of high pressure metals and compounds**. **The customized design** of the insert allows either narrow or wide beam distribution, enabling the achievement of very high uniformity.



CARBON DOPING CELL

The carbon sublimation doping cell is used for carbon doping. The flux of carbon is generated by sublimating **a high purity Pyrolytic Graphite filament**. The Pyrolytic Graphite filament is heated up by direct flow of high intensity current. The region surrounding the filament is made out of the same PG material to warranty **the high purity of the carbon flux**. In normal operation, the filament is heated up in the range of temperature **from 2000°C to 2300°C**.



PHOSPHORUS COMPOUND CELL : GAP

This cell produces a pure **P2 beam from the evaporation of GaP material**. The separation between P2 and Ga is made within **a special Trapping Baffles Unit** placed at the top of the GaP cell crucible. Naturally, the ratio between P2 and P4 is higher than 150 when P is produced by GaP effusion. Thus **very little Pwhite deposition on to the system wall** is observed with this type of cell.



VALVED SOURCES

VALVED CORROSIVE SOURCE: VCOR

The VCOR is a **compact valved source completely made in PbN** and dedicated for corrosive materials evaporation. It is widely used today for **its stability and the comfort of the valve** for a whole series of materials such as Zn, Mg and CdTe whose temperature of evaporation is lower than **750°C**. It is **specifically designed to allow the valve positioning independently of the tip temperature** to limit valve re-calibration throughout the campaign. The loading capacity is fully exploited by the use of **cylindrical shaped charges**.



VALVED CRACKER SOURCE FOR ARSENIC: VAC

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



VALVED CRACKER SOURCE FOR PHOSPHORUS: KPC

The KPC Riber Valved cracker source is a phosphorus beam source for **III-V base semiconductor** MBE growth designed to procure **large loading capacity, rapid flux adjustment with valved shut off possibilities** and **cracking efficiency** that meets the requirements of the production environment.



VALVED SOURCE FOR ALKALINE MATERIAL: NAKCS

This dedicated valved source for alkaline materials (Na-K-Rb-Cs-Fr) produces **high reproducibility and long term stability fluxes**.



MERCURY SOURCE: MCL

Precise control of the source temperature combined to the mercury level setting **enables an excellent flux stability and reproducibility**. The source is also designed to have a **rapid thermal response to temperature changes**, for rapid flux variations. This feature is especially useful for applications which specifically require graded doping and composition.



GAS CRACKERS

GAS INJECTORS AND GAS CRACKERS

The high conductance injector is a gas injector dedicated for the metal – organic molecules (TMG, CBr₄, TEG, TDMAAS, etc.) and is generally used to inject process gases which **do not require thermal cracking** (NH₃, H₂, CH₄, etc.).

The high temperature gas injectors HTI 440 (four gas inlets) and HTI 163 (one gas inlet) are designed for use in any application where **safe and precise complete cracking** of highly stable source compounds (e.g. AsH₃, PH₃, TBP, etc.) is required.



MODULE FOR GAS INJECTOR: GAS CABINET

The Riber gas delivery module is intended for use in any MBE application where **very accurate and reproducible** flux of epitaxial materials is required. Combining the well-known advantages of an **ultra-high purity (UHP)** gas panel with a an **ultra-clean gas injector**, this product enables the user to **precisely control the introduction of very low flow rates of CBr₄ into the MBE chamber**. A two gas line delivery module is also available.



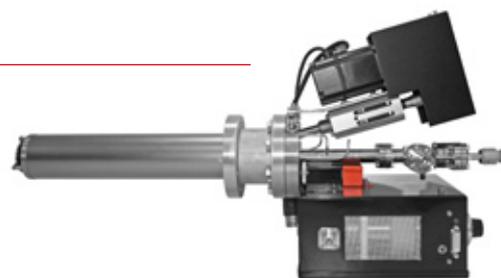
RF PLASMA SOURCE

Riber offers **the largest range of RF sources on the market**. Different materials for the discharge cavity are available to configure the source for the generation of atomic nitrogen, oxygen or hydrogen. RF sources are used for a **wide range of applications** such as nitrides (GaInAlN, etc.), diluted nitride (GaInAsN, II-VI doping), oxides (ZnO, spintronics, high-K, etc.), diluted oxides (doping, mixed nitride / oxide) and in-situ hydrogen surface cleaning. **An innovative RF cavity/coil coupling** is used to obtain the highest atomic species production efficiency on the market for RF plasma sources.



VALVED RF PLASMA SOURCE: VRF

Compared to standard RF Plasma sources, this new source offers **an ease of control** similar to the Valved Cracker cell compared to a standard effusion cell. While the **valve is closed**, the source can retain the **same working conditions** and is ready to use without needing to wait for the start-up and stabilization of plasma as required with the standard RF source.



HIGH TEMPERATURE AND O₂/NH₃ RESISTANT HEATERS

Riber provides a heater model for both research and production, compatible with **oxide environment** such as O, O₂, O₃, NO₂, N₂O, etc, but also with **nitrogen environment** such as N, N₂, NH₃, etc. Its design has demonstrated excellent performance in reactors with a **high base pressure of oxygen and nitrogen**. Its design allows choosing the right filament technology regarding the application and environment used. The Riber high temperature and O₂/NH₃ resistant heaters are dedicated to process temperatures **higher than 1100°C for a substrate**. For research systems, high uniformity profiles are achieved through the **incorporation of a sophisticated confinement shielding design**. Cleaning operation is achieved through carefully selecting the construction materials. Only tantalum, molybdenum and tungsten are used in hot zones



SPECIALIZED CELLS

HIGH TEMPERATURE EFFUSION CELL: HT

High temperature effusion cells provide **clean operation under UHV environment** at temperature up to **2000°C**. This cell is designed for **ease of use with low vapor pressure** materials which usually require the use of an electron-gun for evaporation. The necessary temperatures for most vacuum thin deposition operations can be achieved readily through use of **a robust, resistively heated filament**.



MINI CELL : MIC 19

The Minicell is a **small capacity (1-12cm²)** effusion cell compatible with any commercial or homemade deposition system. The Minicell technology **integrates a compact oven** (heating element made of tantalum + thermocouple). **The contact thermocouple** senses the temperature at the bottom of the crucible allowing precise reproducibility of the deposition rate. It integrates also **a water shielding** and is equipped with **a pneumatic shutter** allowing the deposition of sub monolayer control. The Minicell is dedicated for the vaporization of materials in a range from **80°C to 1600°C**.



DOUBLE CLUSTER CELL: DCC

The Double Cluster Cell – DCC- is a cluster integrating **two Minicells**. The double effusion cells are fitted on a DN63CF Flange (4' ½). Each cell has an **individual water shield and a shutter mechanism**. The two cells can be operated independently from each other. The water shield surrounding each cell minimizes the temperature cross talk between the effusion cell. **The thermal separation of each source** allows to use the double cluster cell with metals of different evaporation temperatures without any risk of cross contamination. The DCC can be advantageously used on MBE system (ex: C12 - C21) as **a dopant cell like Silicon** (n-type) and **Mg** (p-type) for example.



MEDIUM & HIGH TEMPERATURES CELL : MHT

The Riber medium and high temperature effusion cell provides thermal evaporation of charge materials up to **1600°C**. Thanks to its original design, the MHT cell is equipped with **only one single and durable heater filament** that makes it very successful at a low cost. The cell is dedicated for the vaporization of a **very large variety** of low vapor pressure materials.



TECHNOLOGICAL LEADERSHIP

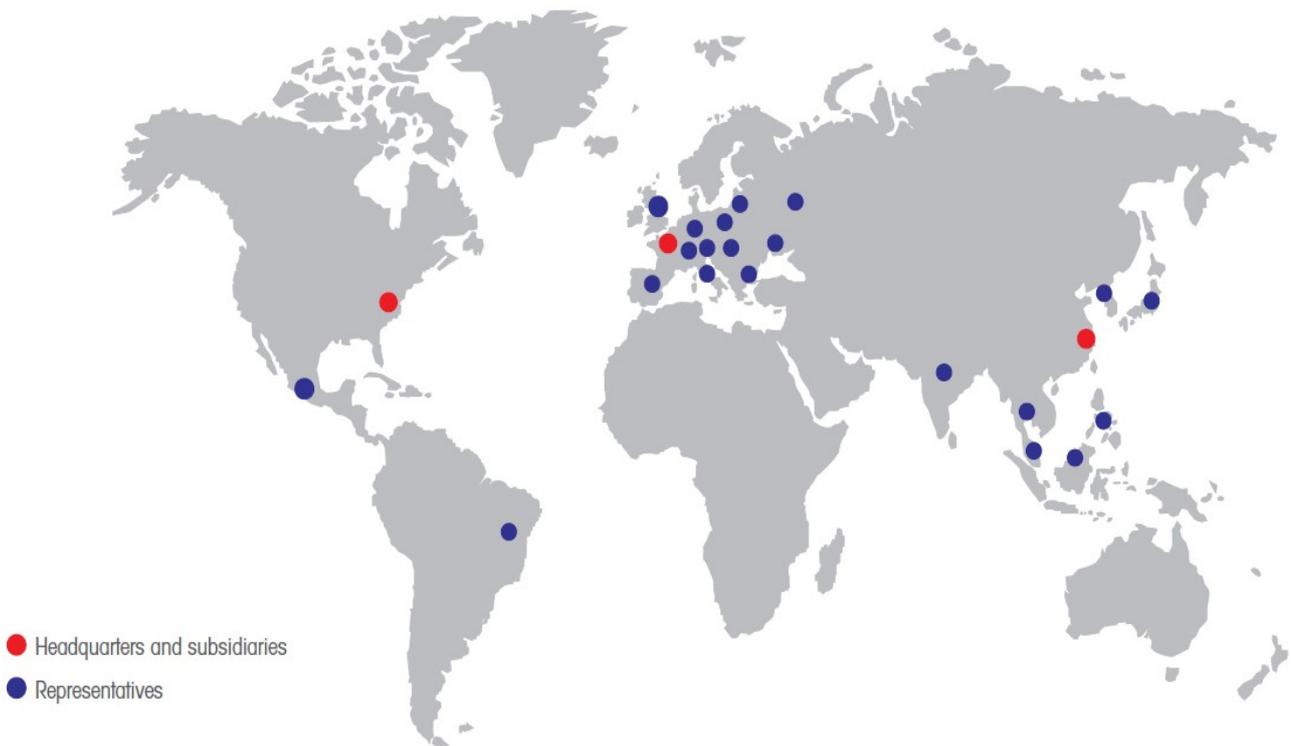
Riber is the world leading supplier of MBE processing equipment and related services.

In total, 750 of our MBE systems have been installed with at least one system in each of the 35 countries with which MBE is involved. This represents 75% of the global market.

Capitalizing on its 30 years of experience, the company's core philosophy is to design systems in close association with customers. Riber has invented and designed major features which are now found in all MBE systems.

Riber plays a key role in the development of MBE technology, providing customers with solutions from equipment to epitaxial growth.

WORLDWIDE PRESENCE



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