CBr4 Module for Gas Injector

- **High and low doping levels**
- **Very accurate and reproducible p-type doping**
- **Safe and easy to operate via dedicated PLC & pneumatic valves**
- **Flux adjusted by high precision baratron**
- **Embedded adapted pumping**

Product introduction

As an alternative to the use of carbon filament source, high doping levels in GaAs, AlGaAs and GaInAsP can be achieved by using carbon tetrabromide (CBr4) without carrier gas (by direct evaporation). Hole concentrations of 1x1020 at/ cm3 (CBr4 BEP~ 1x10-6 Torr) in GaAs and 9x1019 at/cm3 in InGaAs are reported.

The Riber CBr4 delivery module is intended for use in any MBE application where very accurate and reproducible p-type doping of epitaxial materials is required. Combining the well-known advantages of an ultra-high purity (UHP) gas panel with a real ultraclean UHV gas injector, this product enables the user to precisely control the introduction of very low flow rates of CBr4 (< 5.10-3 sccm) into the MBE chamber.
Safety and ease of operation are the major features of the design.

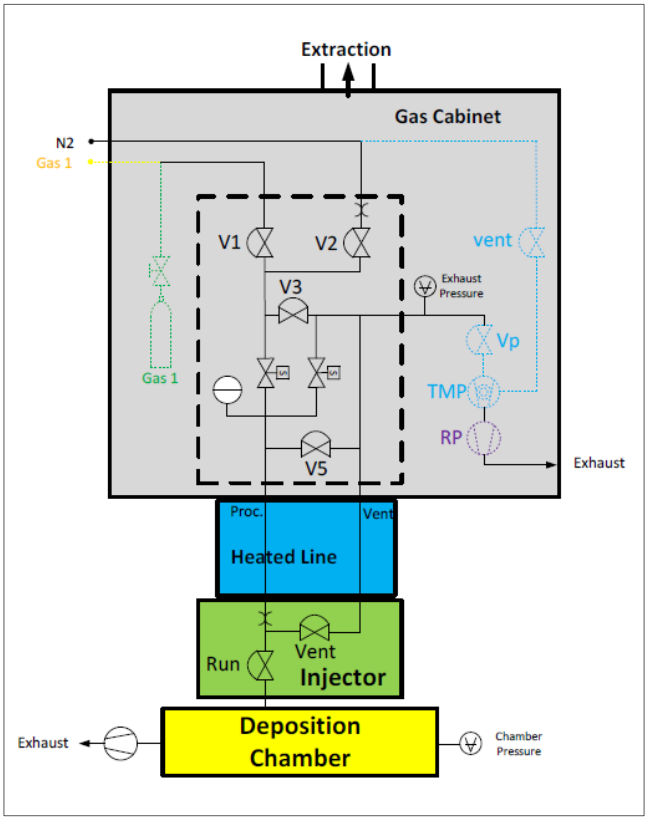
The gas panel and all the necessary accessories are enclosed within a safety gas box which can be easily placed close to the MBE system frame.

Carbon tetrabromide is brought to the vapor phase so that it can be used in the process. Evaporation is achieved by heating the CBr4 cylinder through a heating jacket (optional) and by using a pressure control system between the source and the process to control the flow of vapor. The feed line is heated by means of a heating tape to preclude condensation due to temperature drops in the pipework.

All the gas flow components (i.e. the shut-off valves, the Baratron pressure regulator, Run/Vent switching operations) can be operated from the gas box front panel for tests or maintenance purposes Remote control is then performed through Riber Crystal XE MBE process software.

Due to the low amount of process gas involved, there is no need for an additional pumping group on the MBE chamber. However, wasted gas is evacuated through the exhaust and vent lines with a corrosive-gas version pump.

Layout



The gas panel is designed to meet ultrahigh purity standards in terms of materials and fabrication techniques. Gas flow components are strategically placed to eliminate dead volume. Tubing is 316L SS, and VCR® fittings are used to join components. The external leak rate is less than 5 x 10^{-10} std.cm^3/s.

The CBr4 cylinder is connected to valve V1 through a ¼ inch VCR® fitting. Pure nitrogen can be used as a purge during the idle states to ensure ultra-clean integrity. N2 enters the panel through valve V2. Selection of high/low pressure range for fast & easy flux adjustment is controlled with the valve V3. The flux is regulated using a pressure control system (servo-valves + Baratron transducer). Valve V5 is used to bypass the pressure control system during exhaust and purge sequences.

A high conductance 1/2" O.D. feed line (customer tailored) joins the gas panel to the gas injector. CBr4 is injected into the MBE chamber through the run/vent pneumatic valve fitted to the Riber LTI 163 gas injector. This low temperature gas injector ensures safe and precise handling of metalorganics (see dedicated page).

Specifications

Gas Cabinet Layout	
Dimensions (HxWxP)	2200x600x550
Support Feet / Wheels	4
Door lock	1
Warning and status	Tricolor lights (ROG) and buzzer
Gas lines	1
Gas	
Process Gas	CBr4
CBr4 Conditionning Cylindre	Max Ø55 x 160 - VCR 1/4"-M (not included)
Temperature regulated heating jacket	30-95°C +/-2°C
Temperature regulated Gas line heating	up to 60°C +/-5°C
Fittings	
N2 Inlet Connection	VCR® 1/4"-M
Compressed Dry Air (CDA) Inlet Connection	Compression fitting Ø6 (Swagelok)
Cabinet extraction connection diameter	Ø125
Run/Vent Line hose Diameter	Ø125
Roughing Port	KF16
Process Gas Run Line	VCR® 1/4''-F
Process Gas Vent Line	VCR® 1/2''-F
Requirements	
Power Supply	230 VAC-50Hz, 16 A
N2 Purge inlet pressure (absolute Bar)	1.0 < PN2 < 1.2
Compressed Dry Air (absolute Bar)	4.5 < P < 8 bar
Cabinet extraction speed	>150 m3/h

CELLS & COMPONENTS – CBr4 gas cabinet

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