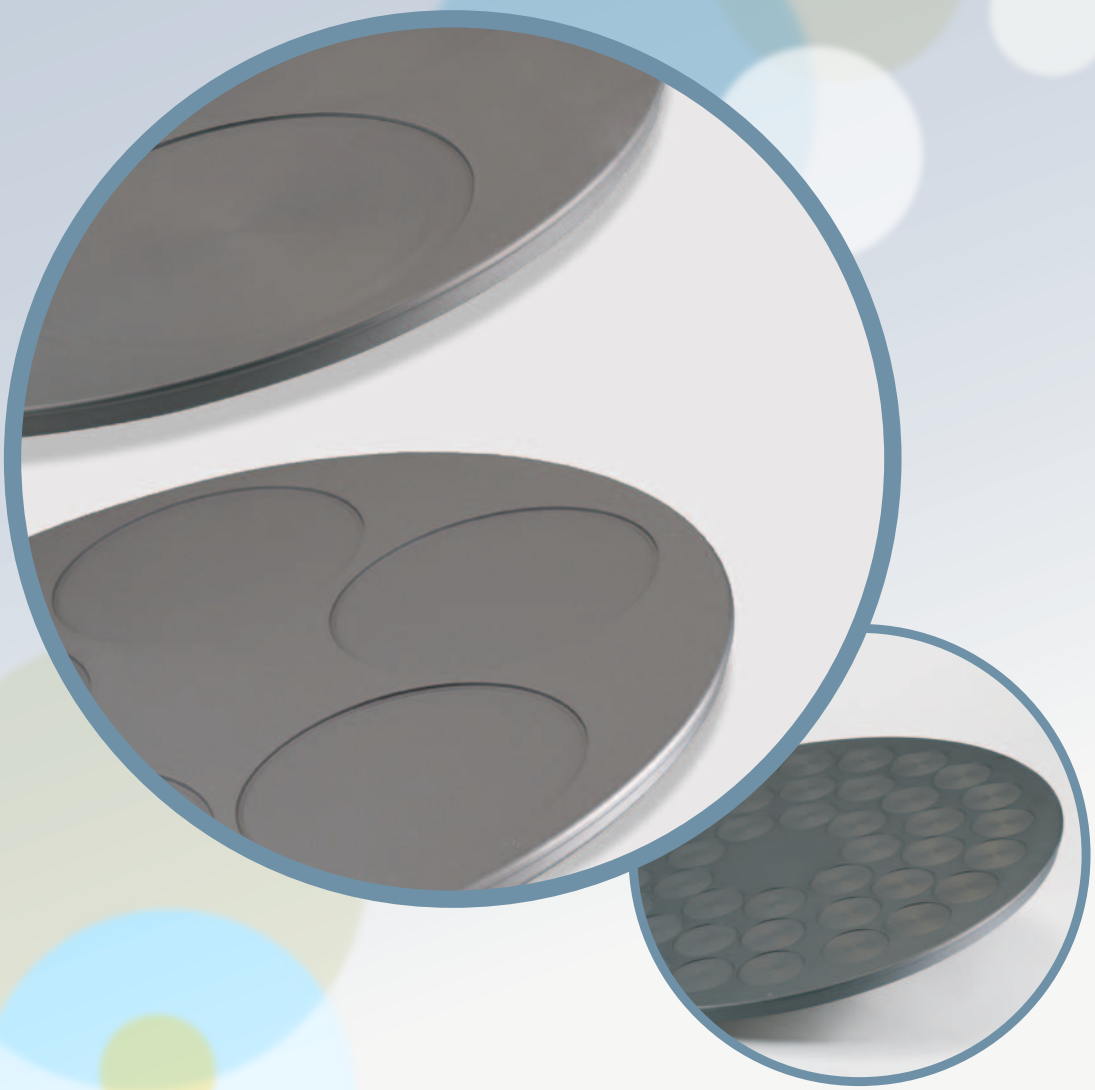
WAFER CARRIERS FOR MOCVD

HIGH PURITY COATED GRAPHITE

PRODUCT



MERSEN

MERSEN in the Semiconductor industry:

Beyond the development of the silicon semiconductor industry, the compound semiconductor has opened a new range of electronic applications.

A couple years ago, one could find compound semiconductors in limited number of devices like GaAs RF transistors, small LED displays, laser diodes, optical receivers and transmitters. Today, Compound semiconductor growth is driven by mass applications: LED lighting, Flat panel displays, Power electronics, Concentrated PV.

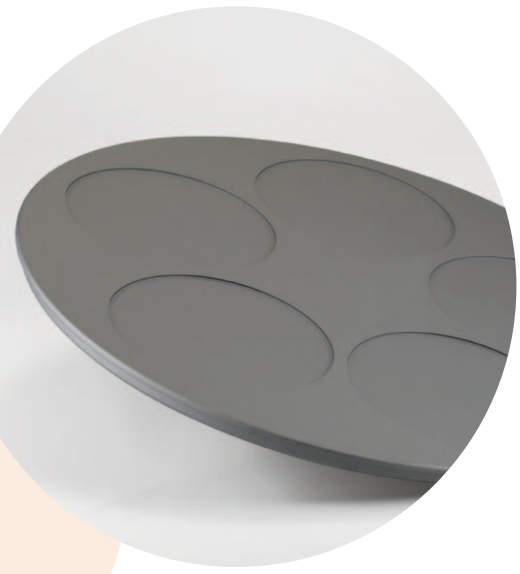
Mersen traditionally supplies high quality coated isotropic graphite parts to OEMs and after-market customers in the electronics industry, including single crystal growing furnaces, epitaxy reactors, MOCVD reactors, dry etchers, ion implanters, and many more.

A strong expertise and know-how for epitaxy & MOCVD

For more than 20 years, our Bay City and Midland facilities in Michigan USA supply major Silicon and Compound semiconductor chip' manufacturers with high purity coated graphite consumables for epitaxial processing:

Products :

- Wafer carrier
- Susceptor
- Planet
- Satellite
- Platter
- Barrel
- Single wafer



Wafer carrier

Planet

Satellite

MATERIAL EXPERTISE

Large cold isostatic press St Marys PA

To grow highly defined interfaces between individual epitaxial layers, MOCVD process engineers rely on quick and tunable temperature transitions of their process: High speed ramp-up and cool-down cycles of the wafer carrier should be regulated either through inductive or radiative heating with an extreme precision.

High purity iso-molded graphite

Mersen is a leading specialty iso-molded graphite manufacturer, with two major production facilities located in St Marys PA (USA) and Chongqing (China).

Our graphite grades are engineered to fit the application. Mersen optimizes the thermo-physical properties of its graphite grades to withstand the operating constraints of most existing MOCVD tools:

- Bear fast radiative heating cycles without cracking
- Ensure temperature uniformity on a large scale
- Guarantee a long term integrity of the protective coating
- Avoid any contamination processing high purity graphite

Typical impurities in SiC coating measured with our in house ETV-ICP-OES

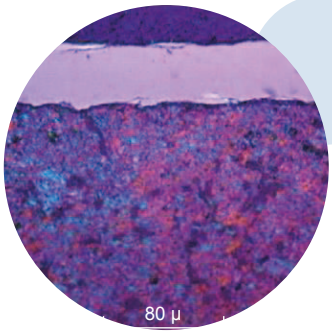
Elements	Concentration ppm	Detection limit ppm
P	0.05	0.03
S	0.1	0.02
As	ND	0.04
Sn	ND	0,04
Zn	0.01	<0.005
Cr	0.03	0.02
W	ND	0.02
Si	MATRIX	0.02
Te	ND	0.08
Pb	ND	0.032
Cd	ND	<0.005
Co	ND	0.006
Ni	0.006	0.005
Fe	0.06	0.02
B	0.48	0.01
Mn	ND	<0.005
Hf	ND	<0.005
Ge	ND	0.006
Ta	ND	0.007
Mg	0.03	<0.005
Mo	0.08	0.011
V	ND	<0.005
Be	ND	<0.005
Cu	0,05	<0.005
Ag	ND	<0.005
Ti	ND	<0.005
Zr	ND	<0.005
Ca	ND	0.025
Al	0.08	0.007
Ga	ND	0.006
Ba	ND	<0.005
Na	0.05	0.016
Li	ND	<0.005
K	ND	0.026

ND : Not Detectable

High purity CVD coating

Because the properties of its high purity isotropic graphite are uniform and repeatable, Mersen has been able to develop **high integrity protections, suitable for MOCVD.**
Our graphite carriers are processed in a **clean room environment** to avoid surface contamination and get ultra-clean coatings.

- Pyrocarbon coating for GaAs epitaxy
- SiC coating for GaN epitaxy
- TaC coating for SiC epitaxy



SiC layer on iso graphite

MERSEN, YOUR PARTNER TO REDUCE THE TOTAL COST OF OWNERSHIP OF YOUR PROCESS

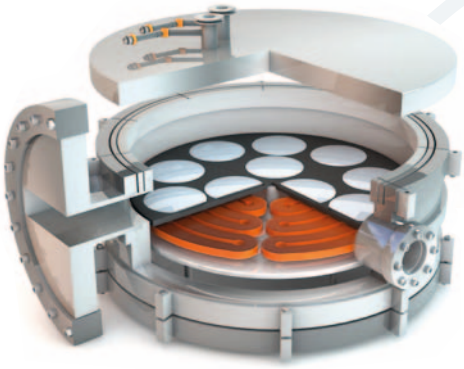
Your goal is the optimization of a **highly complex system combining:**

- **The wafer**
- **The graphite wafer carrier**
- **The MOCVD machine**

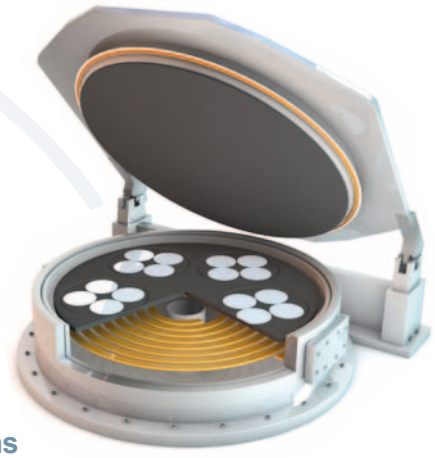
Mersen develops long term partnerships with semiconductor manufacturers by supporting their R&D and production efforts.

MOCVD systems and processes:

Inductive or radiative heating
Temperature of process
Ramp up and cool down cycles
Etching



MOCVD machine using radiative heating



MOCVD system using inductive heating

Mersen Partnership

OUR SERVICES AND COMMITMENTS :

- **Quick turnaround of your R&D designs**
- **Custom pocket designs**
- **Multiple pocket designs within one carrier to speed up R&D**
- **Critical dimensions report provided with each carrier**

WAFER CARRIER:

High precision pocket profiles
Repeatable geometries
Coating uniformity

WAFER :

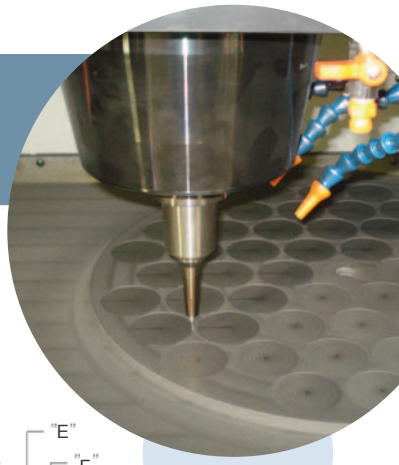
Material : Sapphire, SiC, GaAs, Si
Diameters : 2" to 8"
Thickness
Patterning process

OUR OBJECTIVE

Our objective is to help you to reach the best temperature uniformity:

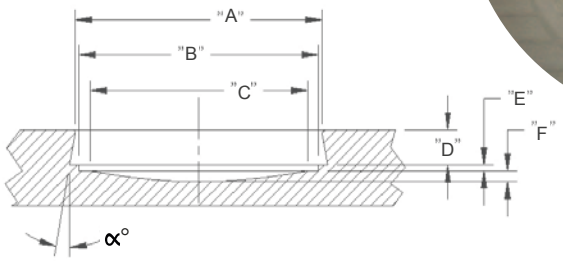
- **Within the pocket**
- **Pocket to pocket**
- **Batch to batch, for a long time**

HIGH PRECISION DESIGN & MACHINING

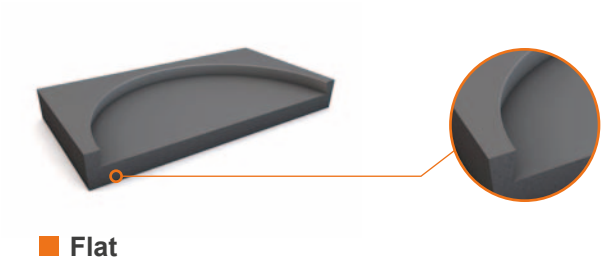


Mersen has developed a dedicated CAD and machining process to manufacture customizable and accurate pocket and susceptor designs.

Our typical machining capability is at +/- 5µm.

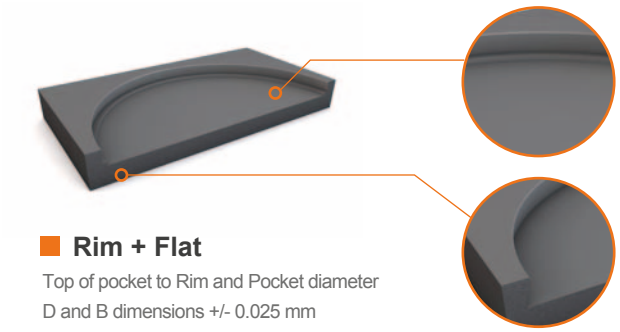


A key engineering topic to reach the **best temperature uniformity**:
Customize the pocket designs to fit with different wafer geometries and thermal behaviours



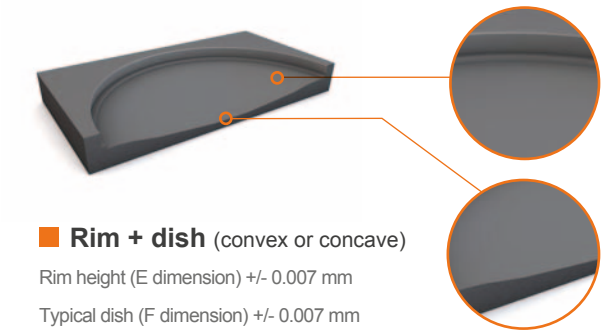
Flat

Pocket diameter and edge angle
A dimension +/- 0.05 mm
∝ angle +/- 0.1°target



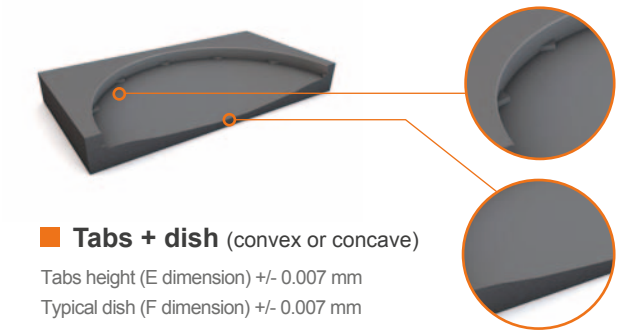
Rim + Flat

Top of pocket to Rim and Pocket diameter
D and B dimensions +/- 0.025 mm



Rim + dish (convex or concave)

Rim height (E dimension) +/- 0.007 mm
Typical dish (F dimension) +/- 0.007 mm



Tabs + dish (convex or concave)

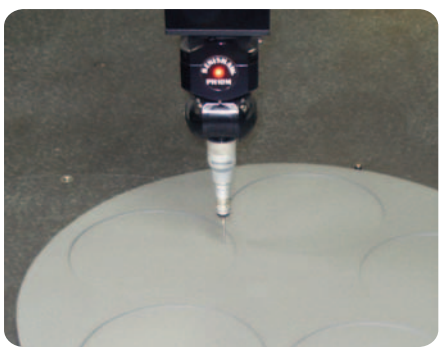
Tabs height (E dimension) +/- 0.007 mm
Typical dish (F dimension) +/- 0.007 mm

Quality control and parameters monitoring

All the parts are measured with CMMs, with a precision of 2.5µm, before and after the CVD process.

All the key parameters during the coating runs are recorded and stored for 5 years.

The coating thickness is determined accurately.



MERSEN
Expertise, our source of energy

A WORLD EXPERT
in materials and solutions for high temperature processes

A GLOBAL PLAYER

Global expert in materials and solutions for extreme environments as well as in the safety and reliability of electrical equipment, Mersen designs innovative solutions to address its clients' specific needs to enable them to optimize their manufacturing process in sectors such as energy, transportation, electronics, chemical, pharmaceutical and process industries.

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