

# MICROWAVE SYSTEMS, REDEFINED



High-Efficiency *Microwave Systems* for Scientific and Industrial Use

*Not just a  
Substitute for Imports  
An Export-Grade  
Standard*



Engineered in India. Matched Globally.

# ABOUT US

VB Ceramic Consultants is a pioneering name in the field of high-temperature research equipment and custom-engineered laboratory instruments. Under the visionary leadership of Dr. V. Viswabaskaran, a distinguished expert in ceramic engineering with over two decades of experience, we have consistently delivered cutting-edge solutions that empower advanced research and industrial development.

With deep-rooted expertise in materials science and thermal processing, we specialize in designing and manufacturing advanced equipment for ceramic testing, materials synthesis, and high-temperature applications. Our instruments are trusted by leading Indian R&D organizations and academic institutions including IITs, NITs, DRDO, CSIR, ISRO, and various public and private sector industries.

At VB Ceramic Consultants, we take pride in being a one-stop partner for the Indian ceramic and materials research community—committed to innovation, quality, and long-term support.



## ABOUT OUR MICROWAVE SYSTEMS

VB Ceramic Consultants is a leading manufacturer and technology provider of microwave-based thermal processing systems, designed for precision, energy efficiency, and versatility in laboratory and industrial environments.

With a strong track record of supplying over **100+ microwave systems across India and abroad**, our offerings include **microwave sintering furnaces, microwave plasma reactors, microwave dryers, extractors, and customized microwave-assisted systems** tailored for material synthesis, waste treatment, and nanotechnology research.

Our systems are built on advanced design principles, ensuring uniform heating, faster processing, and superior thermal control. These systems have been widely adopted by top-tier research institutions, universities, and industries for applications ranging from ceramics and composites to energy materials and environmental engineering.



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# MICROWAVE FURNACE

SUPER

## Specification

|                       |                                                               |
|-----------------------|---------------------------------------------------------------|
| Inner Chamber Size    | Approx. 300 x 300 x 300 mm (SS 304)                           |
| Outer Dimensions      | Approx. 700 x 700 x 1400 mm                                   |
| Insulation            | Zircar SALI board (USA Make)                                  |
| Maximum Temperature   | 1600°C                                                        |
| Operating Temperature | 1500°C                                                        |
| Heating Source        | Microwave (2.45 GHz, 4 × 1.1 kW magnetrons)                   |
| Power Output          | Through SMPS, 2.2 kW per set; 2 sets with automatic switching |
| Cooling System        | Water-cooled magnetrons with chiller                          |
| Temperature Control   | Eurotherm 3216 PID, 16-segment programmable                   |
| Temperature Sensor    | Non-contact IR sensor (Raytek, USA)                           |
| Susceptor Material    | Modified SiC tiles – 10 nos.                                  |
| Chiller Capacity      | 50 L tank, 20 L/min flow, 5–10°C range                        |

## Applications

### Sintering of Advanced Ceramics

Rapid and uniform sintering of ceramic components with enhanced microstructural control.

### Microwave-Assisted Carbothermal Reduction

Accelerated reduction of metal oxides (e.g.,  $\text{TiO}_2$ ,  $\text{Fe}_2\text{O}_3$ ) using carbon sources in a controlled atmosphere.

### Synthesis of Advanced Functional Materials

Rapid fabrication of materials like perovskites, ferrites, and high-entropy oxides for energy and electronic applications.

### Development of Solid Oxide Fuel Cell (SOFC) Components

High-temperature sintering of anode/electrolyte/cathode layers with enhanced densification and phase purity.

### Microwave-Induced Reactions under Vacuum or Controlled Atmosphere

Ideal for CVD processes, nitridation, and other reactions requiring an inert or reducing atmosphere.

### Heat Treatment of Ultra-Hard Materials

Processing of SiC, AlN,  $\text{ZrB}_2$  and other ultra-high temperature ceramics for aerospace and defense applications.

### Thermal Treatment of Nanomaterials

Controlled crystallization or phase transition of nanopowders and nanocomposites with minimal grain growth.



# MICROWAVE SPRAY PYROLYSIS

## Specification

|                            |                                                                           |
|----------------------------|---------------------------------------------------------------------------|
| Evaporation Capacity       | Up to 25 L/hour                                                           |
| System Footprint           | Approx. 1000 mm × 1000 mm × 1500 mm (W×D×H), floor-mounted                |
| Chamber Construction       | SS 316 (250 mm dia × 800 mm height); Quartz viewing window                |
| Powder Collection          | Dual SS powder collection tubes (1 extra spare included)                  |
| Microwave Heating          | 2× Magnetrons (9 kW each, total 18 kW), 2.45 GHz; Max temp 800 °C         |
| Air Heating System         | APM Kanthal elements, 12 kW, max 1000 °C (inlet), 800 °C (chamber)        |
| Spraying Mechanism         | SS special anti-clog spray gun with digital peristaltic pump (10–100 RPM) |
| Reactor Tube               | Quartz material, high-temperature resistant                               |
| Compressor System          | 1 HP inbuilt compressor, 100 L tank, 25 CFM, adjustable 1.5 bar pressure  |
| Cyclone & Pipe Network     | SS 316 with polished finish                                               |
| Material Residence Time    | Up to 30 minutes in spray chamber                                         |
| Spray Chamber Output Temp. | Approx. 200–300 °C                                                        |
| Control System             | 3× TAIE 16-segment PID controllers + non-indicating backup controller     |
| Temperature Sensors        | 3× K-type thermocouples (inlet air, chamber, outlet gas)                  |
| Spray Gun Tubing           | Transparent silicon hose for peristaltic delivery                         |



# HYBRID MICROWAVE FURNACE

## Specification

|                              |                                                             |
|------------------------------|-------------------------------------------------------------|
| Hot zone size                | ≈ 120 x 120 x 120 mm (H x W x L)                            |
| Applicator cavity size       | ≈ 300 x 300 x 300 mm (W x H x D)                            |
| Insulation                   | 150 mm thick SALI (Zircar USA vacuum formed ceramic boards) |
| Max temperature (resistance) | 1900°C (element temp), 1800°C continuous operation          |
| Max temperature (microwave)  | 1700°C (max), <1600°C (operating)                           |
| Heating elements             | MoSi2 (Kanthal), U-shaped, 6/12 size, 4 nos, 4kW total      |
| Microwave system             | 4 x 1.1kW magnetrons (2.45 GHz), total 4.4kW, water cooled  |
| Magnetron cooling            | Water cooled, with safety interlocks (over-temp, arc, flow) |
| Waveguide system             | WR430 & WR340, VSWR 1.02 max, Al clear chemical film        |
| Control system               | Eurotherm 3216 PID programmer + IR pyrometer (±1°C)         |
| Operation modes              | Manual & Auto mode for both power & temperature control     |
| Transformer                  | 4 KVA, air cooled, H insulation, 200A/25V                   |
| Shell & cooling              | SS double wall, water circulating to keep skin ~70°C        |



# MICROWAVE REACTOR

## Specification

|                     |                                             |
|---------------------|---------------------------------------------|
| Hot zone size       | ~150 mm Ø x 2000 mm L                       |
| Applicator cavity   | ~300(W) x 300(H) x 3000(D) mm               |
| Reactor shell size  | ~1000(W) x 1350(H) x 3000(D) mm             |
| Microwave power     | Total 10 kW (8 × 1.1 kW magnetrons)         |
| Microwave frequency | 2.45 GHz                                    |
| Max temperature     | 250°C                                       |
| Temperature control | Eurotherm 3216 PID + IR pyrometer           |
| Insulation          | 50 mm SALI (Zircar USA vacuum formed board) |
| Cooling system      | Water chiller (50L tank, 10 L/min)          |
| Magnetron cooling   | Water cooled                                |
| Operation           | 3-phase, 440V AC, 50Hz                      |
| Modes               | Manual & Auto (power + temp control)        |



# MICROWAVE STIR CASTING

## Specification

|                      |                                               |
|----------------------|-----------------------------------------------|
| Hot zone size        | 300 x 300 x 300 mm (SS 304 chamber)           |
| Insulation           | Zircar SALI USA & alumina boards              |
| Heating system       | 4 × 1.1 kW magnetrons (2.45 GHz)              |
| Max / Operating temp | 1400°C / 1200°C                               |
| Temperature control  | Eurotherm PID (3216), ±1°C                    |
| Crucible             | Graphite (500ml)                              |
| Sensor               | Raytech IR pyrometer                          |
| Power requirement    | 3-phase, 32A MCB with neutral                 |
| Vacuum range         | 10 <sup>-2</sup> mbar                         |
| Stirrer              | 200-300 RPM zirconia coated alloy, belt drive |
| Water chiller        | 50L, 20 L/min, 5–10°C                         |
| Motor & drive        | 0.25 HP Siemens + Danfoss VFD                 |

## Applications

### Microwave-assisted metal melting & casting

Al, Mg, Ni alloys with faster, uniform heating

### Synthesis of advanced ceramic & composite materials

Oxide & non-oxide ceramics under controlled atmosphere

### Recycling & refining of metal scraps

using vacuum + controlled heating to remove impurities

### Thermal processing under vacuum

such as decarburization, deoxidation, improving metal quality

### Microwave sintering of powders & compacts

for rapid densification of ceramic or metallic green bodies

### Alloy development & metallurgical R&D

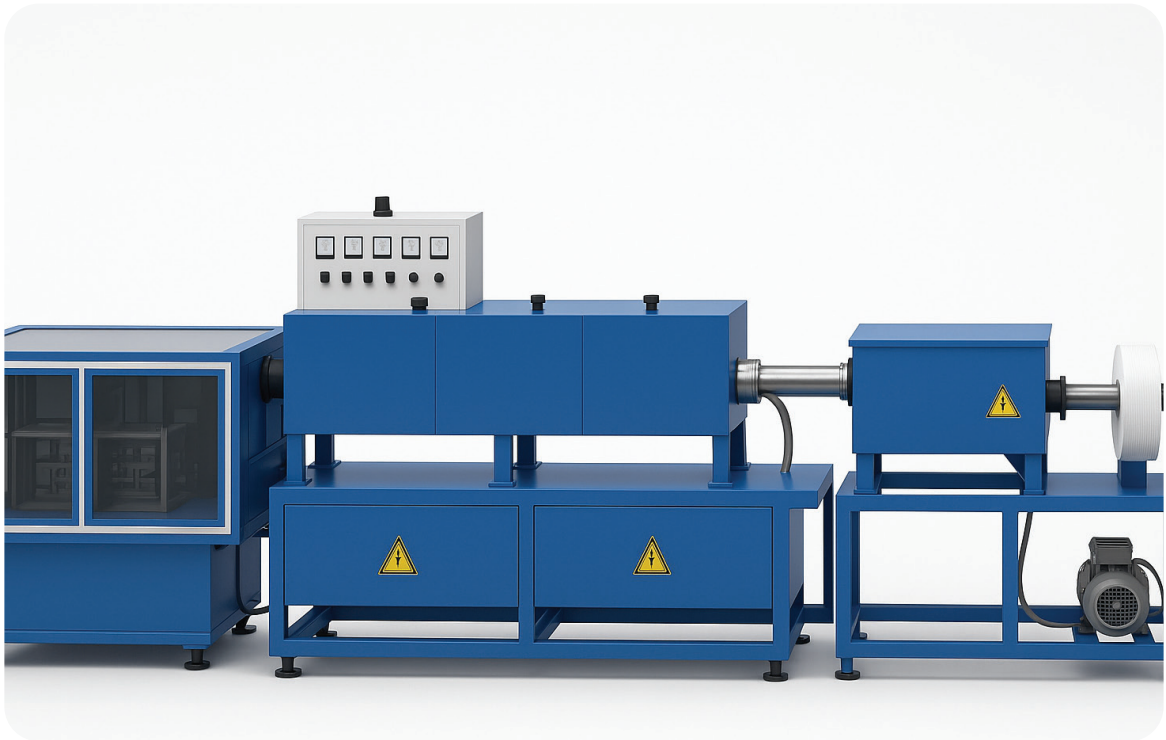
Lab-scale trials for new compositions & microstructures



# MICROWAVE ROTARY FURNACE

## Specification

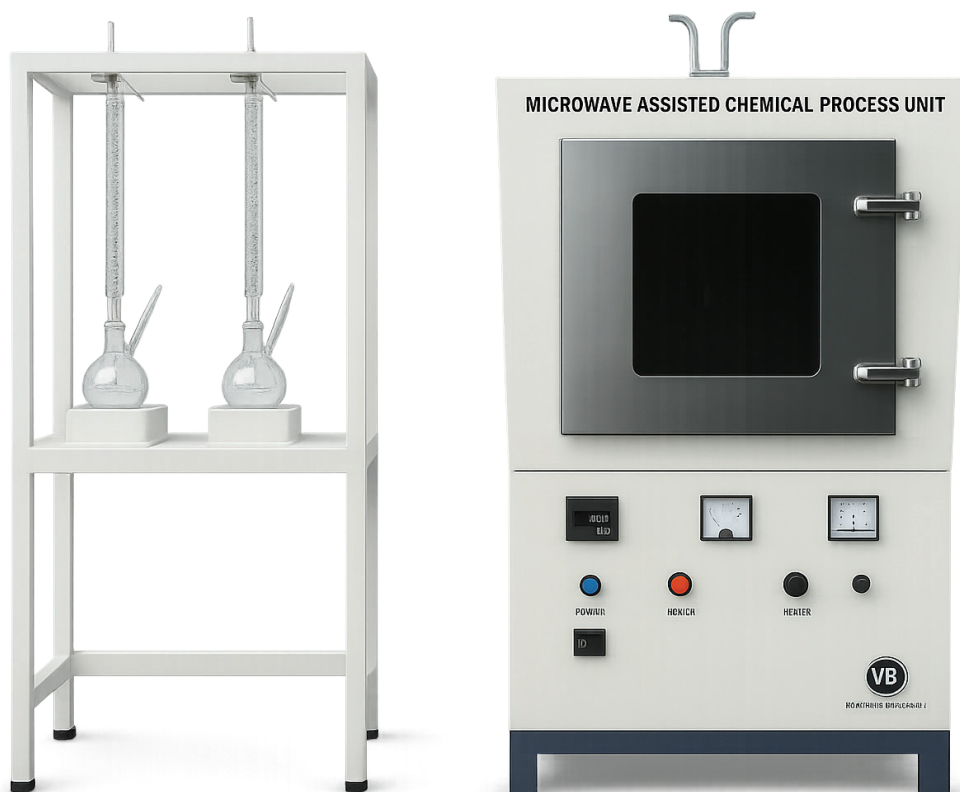
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|-------------------------|-----------------------------------------------------------------------------|
| Heating Mechanism       | Dual-mode: Resistive (Kanthal APM) + Microwave (8×1.1kW magnetrons)         |
| Heating Zones           | Single/multiple + microwave injection along tube                            |
| Maximum Temperature     | 1000 °C (resistive) + enhanced heating via microwave plasma                 |
| Working Temperature     | Room Temperature to 1000 °C (continuous operation)                          |
| Heating Elements        | Kanthal APM solid rods, 2 mm thick                                          |
| Microwave Power         | 8 magnetrons × 1.1 kW = 8.8 kW (focused applicators)                        |
| Tube Material           | INCONEL alloy tubular reactor                                               |
| Rotation & Drive System | 0.5 HP Siemens motor with gearbox, programmable 0–10 RPM                    |
| Feeding Mechanism       | 5 kg hopper with screw conveyor and digital speed control                   |
| Material Collection     | 5 kg capacity reviving bin                                                  |
| Control System          | Eurotherm 3216 with ±1 °C accuracy                                          |
| Power Regulation        | SEMIKRON Thyristor-based phase angle control                                |
| Vacuum & Gas Handling   | Rotary pump with SS 304 pipelines, standard valves, gas purging arrangement |
| Safety & Indicators     | Overload protection, fuses, ammeter, mains/output indicators                |



# MICROWAVE PYROLYSIS

## Specification

|                       |                                                                                                |
|-----------------------|------------------------------------------------------------------------------------------------|
| Heating Type          | Microwave heating using 4×1.1 kW magnetrons (2.45 GHz, total 4.4 kW)                           |
| Maximum Temperature   | Up to 1000 °C                                                                                  |
| Heating Control       | EUROTHERM 3216 16 segment PID controller                                                       |
| Temperature Sensors   | R Type Thermocouple                                                                            |
| Agitation System      | Low-speed motor, 6–20 RPM variable, 2-blade shaft with 45° pitch                               |
| Quartz Reactor Volume | ~3 Liters                                                                                      |
| Gas Purging System    | N <sub>2</sub> gas via rotameter (0–2000 mL/min); external cylinder and regulator (user scope) |
| Vacuum Capability     | Vacuum up to 760 mm Hg using VALUE make pump                                                   |
| Condensing Unit       | Stainless steel construction for volatile condensation                                         |
| Cooling System        | 50 L water chiller with auto on/off, 5–10 °C range, 20 L/min flow                              |
| Power Supply          | Phase angle thyristor control using SCR block from SEMIKRON, Italy                             |
| Control Console       | Integrated bottom-mounted panel with switches and indicators                                   |
| Safety Features       | Pressure relief valve, over-temperature protection, input/output fuses                         |



# MICROWAVE PRESS

## Specification

|                            |                                                                         |
|----------------------------|-------------------------------------------------------------------------|
| Heating Type               | Hybrid: Resistive (MoSi <sub>2</sub> elements) + Microwave (magnetrons) |
| Resistive Heating Capacity | 4 kW total (4×0.82 kW MoSi <sub>2</sub> elements, 1700 °C rated)        |
| Microwave Heating System   | 4×1.1 kW, 2.45 GHz magnetrons                                           |
| Max Furnace Temperature    | 1600 °C (chamber), 1700 °C (at element)                                 |
| Microwave Heating Max Temp | 1400 °C working temperature                                             |
| Heating Rate               | 1–10 °C/min (resistive); 10–25 °C/min (microwave)                       |
| Temperature Controller     | EUROTHERM 16-segment PID programmable controller                        |
| Temperature Sensor         | Non-contact sensor with ±1 °C accuracy                                  |
| Hot Press Capacity         | 10 Ton hydraulic system (vertical down pressing)                        |
| Ram Material               | Inside: Hard Graphite; Outside: Hardened Steel                          |
| Daylight (Punch–Die Gap)   | 100 mm                                                                  |
| Gas Atmosphere Control     | Multiple ports for vacuum, gas inlet/outlet, pressure gauge             |
| Cooling System             | Water-chilled jacket + external water chiller unit (wheel-mounted)      |
| Chiller Specs              | 50 L tank, auto on/off, 5–10 °C control, 100 L/min flow                 |
| Power Control              | Phase angle thyristor control using SCR block from SEMIKRON, Italy      |



# WHY CHOOSE US?



*VB Ceramic Consultants (VBCC) is a highly trusted manufacturer of high-quality ceramic instruments, equipment, furnaces, and kilns. Our clientele includes esteemed universities, renowned R&D organizations, and leading industries, all of whom rely on our superior offerings. With a dedicated team of experts, we offer a range of comprehensive services to ceramic industries, including product development and problem-solving solutions. Having successfully completed numerous projects, VBCC takes pride in its ability to deliver innovative ceramic products, many of which serve as import substitutes. We offer these products along with the corresponding technical know-how, providing our clients with ready-to-use solutions.*

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