

MICROWAVE ASSISTED SYNTHESIS



Advanced Chemistry Reaction Workstations for Faster, Cleaner, More Reproducible Synthesis

Microwave Assisted Synthesis is a transformative chemistry technique that uses controlled microwave energy to drive chemical reactions faster, cleaner, and more reproducibly than conventional heating methods. By coupling microwave energy directly to polar molecules within a reaction mixture, microwave-assisted synthesis delivers rapid, uniform internal heating — dramatically reducing reaction times (often from hours to minutes), improving yields, suppressing side reactions, and enabling chemistries that would be impractical or impossible with traditional oil-bath or heating-mantle methods.

Modern microwave-assisted synthesis workstations combine intelligent microwave power control, real-time temperature and pressure monitoring, integrated stirring, and — in advanced multi-energy platforms — synergistic ultrasonic and ultraviolet irradiation in a single instrument. This combination opens up an entirely new range of synthetic possibilities, allowing researchers to optimize reactions through multiple, simultaneously-controlled energy sources rather than relying on heat alone.

Torontech offers a comprehensive range of microwave-assisted synthesis solutions engineered for the diverse needs of modern chemistry, pharmaceutical, materials, and biotechnology laboratories. The flagship Microwave Assisted Synthesis Multifunctional Chemistry Reaction Workstation UWave-2000 integrates microwave, ultrasonic, and ultraviolet energy sources in one modular platform — supporting atmospheric and pressurized reactions, open and sealed vessels, glass and quartz flasks, and operating across temperature ranges up to 230 °C and pressures up to 5 MPa.

Complementing it, the Microwave Assisted Synthesis Workstation MAS-II Plus delivers focused, high-quality microwave synthesis and extraction with closed-loop PID power control, non-pulse continuous heating, and dual-channel temperature monitoring — making it an exceptionally reliable workhorse for mainstream synthesis and extraction workflows.

Transform Your Chemistry with Microwave Precision

In modern chemistry, time is the ultimate competitive advantage. The laboratory that can run a reaction in twenty minutes instead of twenty hours is the laboratory that publishes faster, develops drugs faster, scales materials faster, and brings innovations to market faster. Microwave-assisted synthesis is the technology that delivers that advantage — and Torontech's UWave-2000 and MAS-II Plus give you the precision, flexibility, and reliability to capture it.

Whether you are developing the next generation of pharmaceutical APIs, synthesizing novel nanomaterials, extracting bioactive compounds from natural products, or exploring entirely new chemistries that combine microwave, ultrasonic, and UV energy in ways never before possible, Torontech has the microwave-assisted synthesis platform engineered to take your research further, faster, and with greater confidence.

Don't settle for the slow, inefficient methods of yesterday's chemistry. Equip your laboratory with the microwave synthesis platform trusted by chemists, pharmaceutical scientists, and materials researchers worldwide.

APPLICATIONS

Applications in Industries

Microwave-assisted synthesis has become an indispensable technique across virtually every research-driven sector of modern chemistry and materials science. The Torontech microwave synthesis range supports an extensive list of applications, including:

- **Organic Synthesis & Medicinal Chemistry** — Acceleration of coupling reactions, heterocyclic synthesis, condensation reactions, and library generation for drug-discovery programs. Reactions that take hours by conventional heating can often be completed in minutes.
- **Pharmaceutical Research & Development** — Rapid API synthesis, scaffold optimization, route-scouting, and process intensification — bridging laboratory-scale research with pilot-scale production verification through scalable open-vessel (up to 2000 mL) and sealed-vessel (up to 500 mL) configurations.

- **Materials Science & Nanotechnology** — Synthesis of nanoparticles, quantum dots, metal-organic frameworks (MOFs), graphene-based materials, and uniform nanostructures using microwave + ultrasonic + UV irradiation combinations for unprecedented control.
- **Polymer Chemistry** — Rapid polymerization, controlled radical polymerization, polymer modification, and biodegradable-polymer development with significantly improved reaction rates and reduced solvent consumption.
- **Natural Product & Organic Extraction** — Microwave-assisted extraction (MAE) of essential oils, bioactive compounds, alkaloids, flavonoids, and phytochemicals from plant materials — delivering faster extraction with higher yields and lower solvent volumes.
- **Food Science & Quality Control** — Microwave-assisted extraction of additives, pesticide residues, nutrients, and contaminants from food matrices for downstream analytical testing.
- **Environmental Analysis** — Microwave-assisted extraction of pollutants, organic contaminants, heavy metals, and trace elements from soil, water, and sediment samples for environmental monitoring.
- **Petrochemical & Catalysis Research** — Catalyst synthesis, catalytic reaction studies, biofuel development, and petrochemical process intensification.
- **Biotechnology & Life Sciences** — DNA/RNA preparation, protein denaturation, biochemical pathway investigations, and rapid biomolecule processing protocols.
- **Inorganic & Coordination Chemistry** — Synthesis of inorganic complexes, ceramic precursors, coordination compounds, and advanced inorganic materials with improved reproducibility.
- **Universities & Academic Research** — Fundamental method development, green-chemistry research, graduate training, and the exploration of novel synthetic pathways across every branch of chemistry.

FEATURES

Why Choose Torontech for Your Microwave Synthesis Needs

With more than two decades of experience supplying advanced analytical and chemistry instruments to laboratories, research institutions, and industrial facilities across more than 60 countries, Torontech has earned a global reputation as a trusted partner for microwave-assisted synthesis solutions. Choosing a Torontech microwave synthesis workstation means investing in more than just equipment — it means partnering with an organization committed to your long-term research success.

Multi-Energy Engineering Excellence

Torontech's UWave-2000 is one of the few microwave synthesis platforms in the world to integrate three independent energy sources — microwave (with automatic frequency conversion), ultrasonic (0–800 W, 28 kHz immersion launcher with auto frequency sweep/lock), and UV irradiation (300 W @ 365 nm standard, optional 100 W @ 254 nm) — all software-coordinated for synergistic activation and deactivation. This multi-energy capability unlocks chemistries that single-energy platforms simply cannot perform.

Industry-Leading Safety Architecture

Every Torontech microwave workstation is built around comprehensive safety architecture — intelligent safety pressure control systems with real-time overpressure alarms, active pressure relief, automatic vessel-type recognition to prevent operator error, composite-fiber-reinforced outer vessels with high-strength metal frames, and multi-layer chemical-resistant chamber coatings. With sealed reactions operating up to 230 °C and pressures up to 5 MPa, safety is engineered in at every level.

Precision Reaction Control

Both Torontech platforms feature dual-channel temperature monitoring — high-precision infrared sensors covering 0–900 °C combined with platinum resistor sensors (± 1 °C accuracy) — and patented piezoelectric crystal pressure control with ± 0.01 MPa precision. The MAS-II Plus adds closed-loop PID inverter control for non-pulse continuous microwave heating, delivering the consistency and reproducibility that demanding chemistry research requires.

Scalable from Bench to Pilot Plant

With open-vessel capacities up to 2000 mL and sealed-vessel options up to 500 mL, Torontech microwave synthesis workstations bridge the gap between exploratory bench-scale research and pilot-scale production verification — eliminating the need to switch platforms when your reactions scale up.

Intuitive Operation & Software

A 7-inch color LCD touchscreen interface, intelligent operating software with safe remote-control capability, optional reaction-process videography for documentation, and modular hardware design make every Torontech microwave platform accessible to researchers at any experience level — from graduate students to senior process chemists.

Expert Application Support

Torontech's team of application chemists and product specialists is available across multiple time zones to support method development, installation, operator training, and ongoing technical service. With offices and authorized partners throughout the USA, Canada, UAE, KSA, GCC, EU, India, APAC, Africa, and Latin America, professional support is always within reach.

Cost-Effective Value

Torontech delivers premium-grade microwave synthesis performance at a transparent, competitive price point — eliminating the inflated cost structures of legacy brands while maintaining the analytical accuracy, durability, and feature set that demanding professionals require.

TECHNICAL SPECIFICATIONS

Product Comparison Table

Choosing the right microwave-assisted synthesis workstation depends on your laboratory's reaction scope, required energy sources, throughput, and budget. The table below provides a side-by-side comparison of Torontech's two flagship platforms — helping you identify the configuration that best fits your synthesis workflow.

Specification	UWave-2000	MAS-II Plus
Class	Multifunctional Chemistry Reaction Workstation	Microwave Synthesis / Extraction Reaction Workstation
Energy Sources	Microwave + Ultrasonic + UV (synergistic, software-timed)	Microwave (closed-loop PID, non-pulse continuous heating)
Open-Vessel Capacity	50 mL – 2000 mL glass flasks (optional quartz)	50 mL – 2000 mL scalable (lab to pilot)
Sealed Pressurized Vessels	100 mL, 200 mL & 500 mL sealed reaction vessels	Sealed reactions supported (high-pressure mode)
Max Temperature (Sealed)	230 °C (long-duration sealed reactions)	230 °C
Max Pressure	Up to 2 MPa sealed reaction; 0–5 MPa monitoring (± 0.01 MPa)	Up to 5 MPa (sealed reactions)
Temperature Sensing	Dual-channel: Infrared (0–900 °C, std 300 °C) + Platinum resistor (0–250 °C, ± 1 °C)	Dual-channel DTD: PT thermocouple + non-contact infrared (auto-switching)
Ultrasonic Module	Immersion launcher, 0–800 W, 28 kHz, auto frequency sweep/lock	Not included (microwave-focused platform)
UV Irradiation	Standard UV 300 W @ 365 nm; optional UV 100 W @ 254 nm	Not included (microwave-focused platform)
Stirring	Mechanical (30–1600 rpm) + magnetic stirring	Integrated magnetic stirring
Microwave Control	Microwave automatic frequency-conversion control	Closed-loop PID with inverter control — non-pulse continuous microwave
Chamber Construction	Multi-layer Teflon-coated 316L stainless steel	Industrial-grade chamber with multilayer chemical-resistant spray

Specification	UWave-2000	MAS-II Plus
Interface	7" color LCD touchscreen + intelligent software + reaction videography	User-friendly touchscreen with intuitive controls
Safety Features	Auto vessel-type recognition, intelligent safety pressure control, real-time overpressure alarm, active pressure relief, composite-fiber outer vessel, high-strength metal frame	Closed-loop temperature/pressure protection, safe under organic-solvent environments
Primary Use Case	Multi-energy advanced research: organic extraction, pharma, protein chemistry, graphene, polymer synthesis, nanomaterials	Organic synthesis, pharmaceutical chemistry, organic extraction, food/analytical/inorganic chemistry, protein, petrochemical, materials chemistry
Best Suited For	Advanced multi-energy R&D labs needing maximum experimental flexibility	Versatile mainstream microwave-synthesis labs needing strong reaction control & reproducibility

In short: choose the UWave-2000 when your research demands maximum experimental flexibility — combining microwave with ultrasonic and UV irradiation, supporting both open and pressurized reactions, and working across the broadest possible temperature, pressure, and vessel range. Choose the MAS-II Plus when your laboratory needs an exceptionally reliable, reproducible, and intuitive microwave synthesis/extraction platform with industry-leading closed-loop PID power control and dual-channel temperature detection.



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