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MILESTONE



HELPING
CHEMISTS

MultiSYNTH

Single- and
Multi-mode
Microwave
Synthesis
System

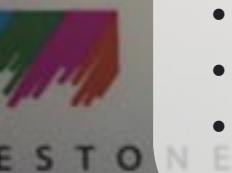


MultiSYNTH Single- and Multi-mode Microwave Synthesis System



MultiSYNTH Advantages

- Unique “hybrid” cavity
- Single-mode and multi-mode configurations
- Innovative shaking/stirring features
- Unsurpassed versatility



MultiSYNTH

All-Syn



The **Benefits** of Microwave-Enhanced Synthesis

Microwave-enhanced chemistry represents a major step forward in the capabilities of synthetic chemists. Since its introduction, it has allowed chemists to run reactions faster than ever before, with higher yields, and to scale-up experiments reliably from milligrams to much larger quantities, without the need of further reaction optimization.

Microwave synthesis offers much more precise control over conditions of temperature and pressure than any alternative technologies, and unsurpassed ease of use. Today, microwave enhanced-chemistry has become a cutting-edge technology across the pharmaceutical, bio-tech, polymer and plastics, and fine- and agro-chemical industries, with thousands of systems operating worldwide.

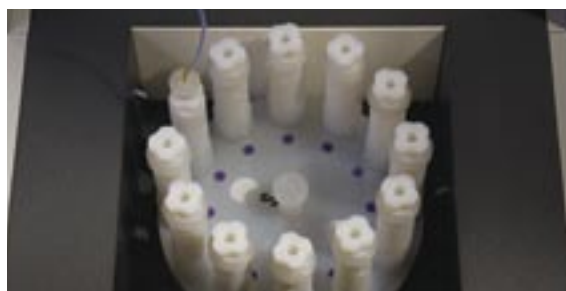
Single-mode and Multi-mode

The Milestone MultiSYNTH combines all the inherent advantages of single-mode microwave technology, such as the capability to efficiently process small reaction volumes with fast heating, with all the benefits of multi-mode cavities, such as the ability to scale-up reactions using a parallel format, with complete reproducibility.



MultiSYNTH with Single-mode Setup

In the single-mode setup, a single vessel is directly positioned in a dedicated single-mode position, in correspondence with the highest energy intensity of the microwave irradiation.



MultiSYNTH with Multi-mode Setup

In the multi-mode setup, a carousel rotates in the microwave cavity, ensuring fast and homogeneous heating of all reaction vessels.

Further Enhancing Single-mode Technology

In traditional single-mode microwave systems, the reaction vial is located inside the microwave waveguide. The position of the vial is very critical, as the microwave intensity varies from 0 to 100% within a width of 30 mm. As a result, temperature may be uneven, particularly for larger scale reaction and with heterogeneous mixtures.

With the Milestone MultiSYNTH, this inherent limitation of single-mode units is overcome by a unique 'mix-and-shake' device. The vial is mechanically shaken during the course of the reaction, to prevent hot spots and to homogenize both temperature and reaction mixture.





The *Unique* Milestone MultiSYNTH

The new Milestone MultiSYNTH is an innovative, compact, and versatile system for microwave-enhanced synthesis. It features both single-mode and multi-mode technologies in a single unit. It performs reflux reactions up to 1000 ml, and pressurized reactions from 0,25 up to 50 ml. The MultiSYNTH offers magnetic stirring capabilities and an exclusive vessel 'shaking' system, to ensure homogeneous temperature distribution throughout the solutions in single or multiple vessels. High-efficiency cooling capabilities contribute to enhance reaction yield during microwave irradiation, and to prevent decomposition or side reactions through quenching at the end of the runs.



Single
10 ml glass vessel



Multiple
10 ml glass vessels



Single
70 ml TFM vessel



Multiple
70 ml TFM vessels



Reflux
glassware



The MultiSYNTH allows efficient 'flash' heating; 3 ml of Ethanol are heated to 150°C in less than 1 minute! In microwave synthesis, rapid cooling is as important as rapid heating. The MultiSYNTH easily accomplishes this task and provides fast cooling of the reactants. 3 ml of Ethanol are cooled from 150°C to room temperature in less than 2 minutes using a stream of compressed air at ambient temperature.

Advanced User Interface



The MultiSYNTH is operated via a compact terminal, with bright, full-color, touch-screen display. The terminal runs Milestone's unique EasyCONTROL software, to provide easy and intuitive control of the reaction with:

- ◆ On-line monitoring and control of all reaction parameters
- ◆ Temperature-driven reaction
- ◆ Microwave power-driven reaction

Temperature control in all vessels

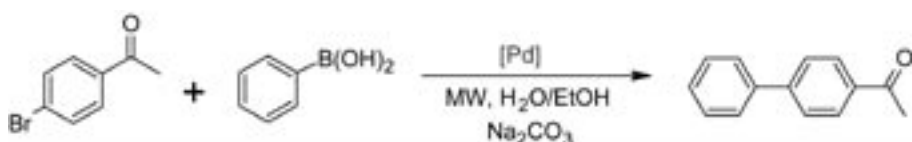


The MultiSYNTH TEMP-SURE feature allows monitoring and controlling of both external and internal temperature in all vials in real time during the course of the reaction. This unique state-of-the-art system results from a combination of fiber optic, infrared and a microprocessor controlled rotor positioning system. The latter enables the software to identify which vessel is passing in front of the infrared sensor, while the carousel is turning. The software correlates the internal and external temperatures data and all temperature profiles are displayed with the corresponding ID code of the vessel. With TEMP-SURE the chemist receives confirmation that each vessel has reached the set target temperature and that this temperature has been held for the appropriate time to allow completion of the reaction.

Applications *Flexibility*



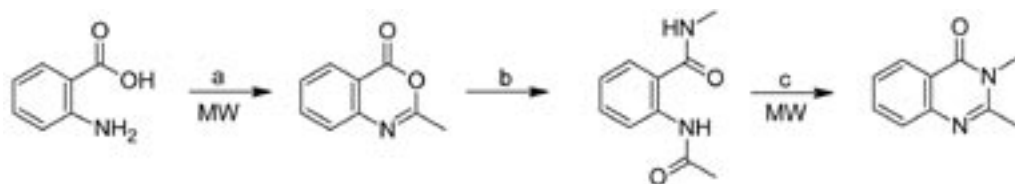
Suzuki coupling reaction



N. E. Leadbeater and J. R. Schmink, *Tetrahedron*, 63, 2007, 6764.

Example of reaction optimized on a 3 mmol scale using the single-mode configuration and scaled up (5 and 10 mmol) using a parallel setup in the multimode configuration with a 99% yield in all the cases.

Synthesis of 2,3-disubstituted-quinazolin-4-ones (10 examples reported)



- a) acetic anhydride, MW (200 W), 130 °C, 10 min.
b) CH_3NH_2 (2 equiv.), CH_2Cl_2 , rt, 20 min.
c) formamide, MW (200 W), 170 °C, 10 min.

I. K. Kostakis, A. Elomri, E. Seguin, M. Iannelli and T. Besson, *Tetrahedron Letters*, 48, 2007, 6609



MultiSYNTH *Technical* Specifications

Milestone MultiSYNTH

Microwave hardware

- Single-magnetron system with homogeneous microwave distribution in the cavity.
- 800 Watt installed power.
- Up to 800 Watt microprocessor controlled output power.
- User-selectable continuous or pulsed emission.
- Single-mode and multi-mode setup.
- Easy access to the microwave cavity by fully automated opening/closing top housing.
- Compact microwave cavity 26,5 x 24,5 x 20,0 (h) cm for high microwave energy.
- Microwave cavity entirely made of 18/8 stainless steel housing with multi-layer PTFE plasma coating applied at over 350°C.
- All hardware protected against acids/organic solvents with polymer coating both on inside and outside surfaces.
- Built-in exhaust system.
- Built-in airflow system, for rapid vial cooling and reaction quenching.

Reaction sensors

- Direct temperature control via optical fiber up to 250°C in a single vessel.
- Contact-less temperature control via infrared up to 300°C in all vessels.

User interface

- 6,5" industrial grade touch-screen controller with 65000 colors.
- VGA resolution 640 x 480 for sharp process graphics.
- 1 USB port to connect printer, 2 PS2 ports for mouse and keyboard, 3 RS 232 ports for external devices.
- Methods and runs saved on Windows™ compatible flash card or pen-drive.
- Weight ca. 68 kg.
- External dimensions 47,5 x 68,0 x 52,0 (h) cm (closed) x 96,0 (h) cm (open).
- Power 220V/50-60Hz, 2,0 kW.

Specifications are subject to change without notice.



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