



# Discover<sup>®</sup> 2.0

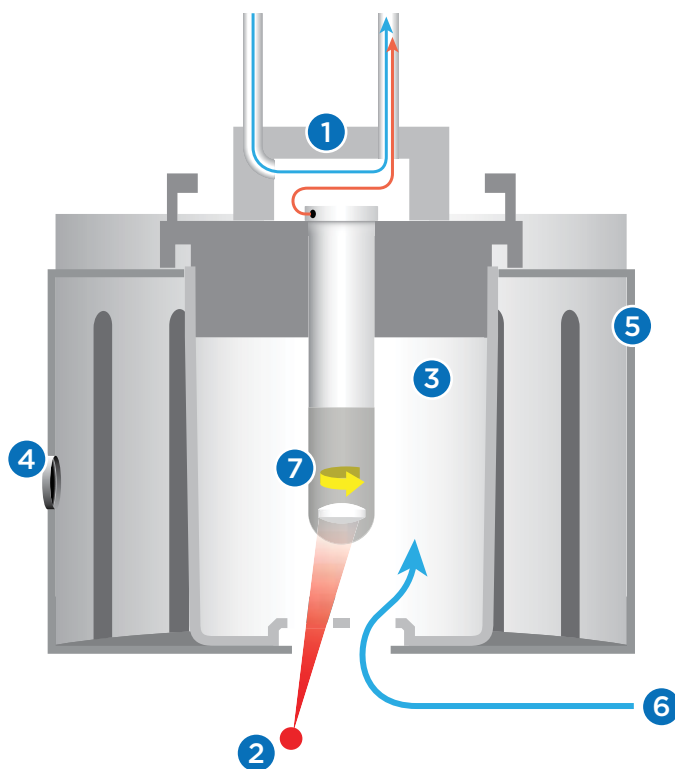
Microwave Synthesizer





## Expand Your Synthetic Chemistry

The Discover 2.0 is the premier microwave reactor for performing any organic or inorganic synthetic chemistry. Featuring a best-in-class 300 mL single-mode microwave cavity and intuitive software with a 10" touchscreen interface, it is possible to program a reaction in seconds and achieve the best synthetic yield in minutes.



## 1 Activent® — Intelligent Pressure Management

Patented pressure management technology allows for programmable reaction venting to relieve gaseous byproducts. This safety feature increases reaction scope and yield while eliminating vessel failures.

## 2 iWave® — True Internal Temperature Sensor

Revolutionary, patented, floor-mounted temperature sensing provides volume-independent and in-situ temperature measurement without delicate thermocouples. This design ensures the most accurate temperature measurement and widest chemistry flexibility with the lowest cost of ownership.

## 3 Scout and Scale Reactions

The largest high pressure/temperature range of any reactor available today. Perform exploratory chemistry at a 200  $\mu$ L reaction volume and scale up to a 100 mL vessel.

## 4 Reaction Recording & Monitoring

Fully integrated 5-megapixel camera with 10" touchscreen interface allows researchers to monitor and record reaction progress.

## 5 Self-Tuning, Efficient Microwave Cavity

Take the guesswork out of ensuring the reaction is positioned correctly every time, no matter which vessel you use. As the reaction progresses, the microwave energy distribution adjusts automatically for changing chemical properties to optimally heat the reaction.

## 6 Compressed Air Reaction Quenching

Rapid cooling upon reaction completion allows safe handling in less than a minute. Superior performance to fan-based systems.

## 7 Electromagnetic Stirring

Homogenize your reaction mixture for the best synthetic results and consistency. Fully adjustable.

### Reliable and Easy to Clean

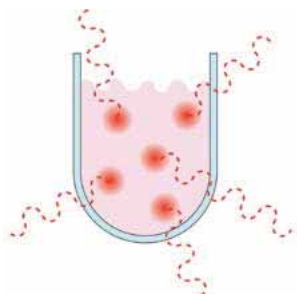
The Discover 2.0 features a robust, proven cavity for efficient heating of sealed vessels and reflux reactions. The patented, circular waveguide efficiently delivers microwave energy from the 900 W installed magnetron to your reaction solution for accurate, reproducible heating profiles. Designed with a removable spill cup and drain tray, the Discover 2.0 is also built for easy cleaning and maintenance. There's nothing to disassemble, just clean out the cup and the tray and you're ready to run another reaction.

# Microwave Advantage

A refined form of energy, microwaves provide unique heating benefits to synthetic chemistry.<sup>1,2,3</sup> Reactions are heated **volumetrically**, **directly**, and **instantaneously**, faster and more efficiently than any other form of heating. These microwave characteristics give organic chemists better product yield and more control over reaction conditions for precise results in materials and inorganic chemistry. Microwave energy is the industry standard for medicinal chemistry, nanomaterials synthesis, and academic teaching labs, owing to these clear advantages.

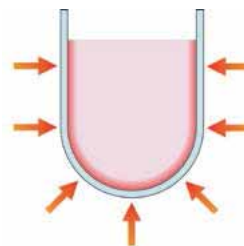
## Microwave Heating

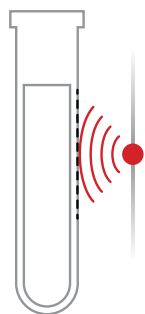
The vessel wall is transparent to microwaves allowing energy to be directly absorbed by the reactants. This direct molecular activation limits side reactions and provides a fast and efficient form of heating. Reactions that previously took hours, or even days, to complete can be performed in minutes.



## Conductive Heating

With hot plates, oil baths, and heating mantles, energy is transferred indirectly to the reactants by applying heat to the outside surface of the vessel and solvent. This form of heating is slower and inefficient, achieving reduced synthetic results.





OK

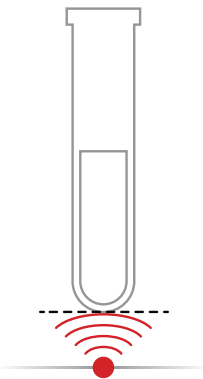
IR sensor  
from side

(Non-iWave)

Accuracy



Convenience



Good

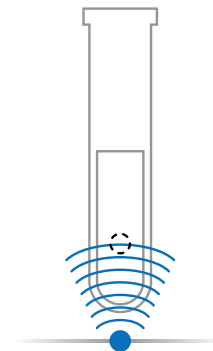
IR sensor  
from below

(Non-iWave)

Accuracy



Convenience



Best

iWave

(Measuring Sample Not Vessel)

Accuracy

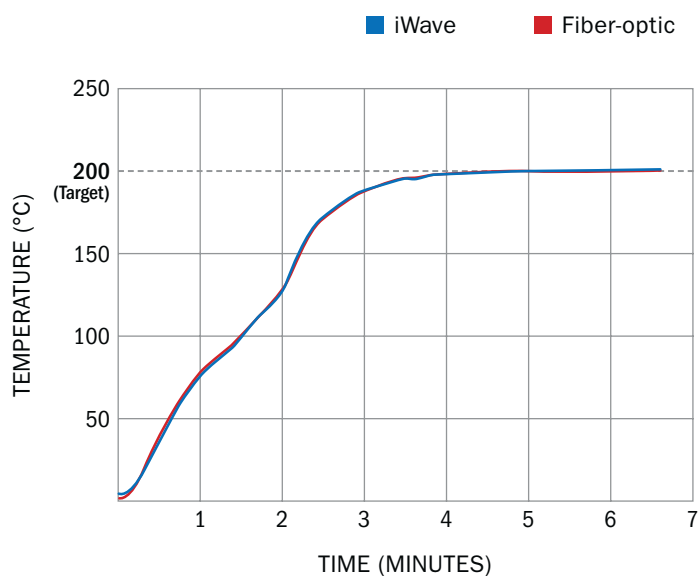


Convenience



## iWave — Sensor that Sees Through Glass and Teflon

For the first time, a single-mode microwave synthesizer utilizing iWave, an intelligent IR temperature sensor that can see through glass and Teflon and measures your sample **not the vessel**. Based on new technology this powerful update eliminates the need for costly and fragile internal fiber-optic probes while providing the most accurate and responsive temperature measurement available.



<sup>1</sup>Dudley, G. B.; Richert, R.; Stiegman, A. E. *Chem. Sci.* **2015**, *6*, 2144-2152.

<sup>2</sup>Chen, P.-K.; Rosana, M. R.; Dudley, G. B.; Stiegman, A. E. *J. Org. Chem.* **2014**, *79*, 7425-7436.

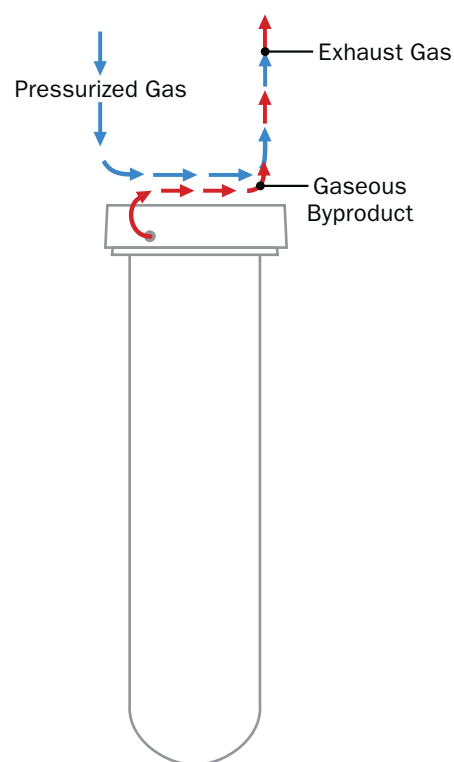
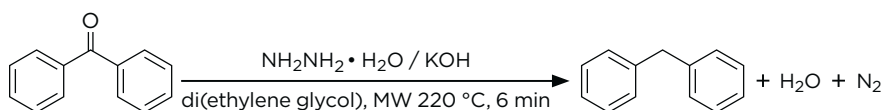
<sup>3</sup>Hunt, J.; Ferrari, A.; Lita, A.; Crosswhite, M.; Ashley, B.; Stiegman, A. E. *J. Phys. Chem. C* **2013**, *51*, 26871-26880



## Activent — Safe, Pressurized Reactions

The Discover 2.0 patented pressure management technology is the latest advance in automated pressure control and the safest way to perform pressurized reactions. This system automatically relieves gaseous byproducts as they form during the reaction, venting safely through exhaust tubing at the back of the system. This significantly reduces vial failures and allows your reactions to reach higher temperatures while requiring only an easy-to-use snap on cap without the need for crimping tools.

### Wolff-Kishner Reduction





# Widest Range of Vessels Available

Discover 2.0 offers the widest range of high-temperature, high-pressure sealed reaction vessels, standard. Perform pressurized reactions in either 10, 35, or 100 mL. Alternatively, non-pressurized open vessel reactions can be run in standard glassware up to a 125mL round-bottom flask. If your chemistry etches glass (HF or strong inorganic bases), use a silicon carbide vessel or even disposable Teflon® liners to get the best results. Disposable liners can easily be used as the IR temperature sensor sees through glass and Teflon.



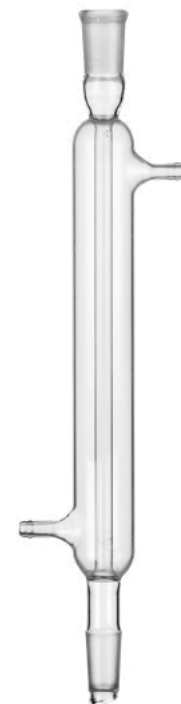
10 mL



35 mL

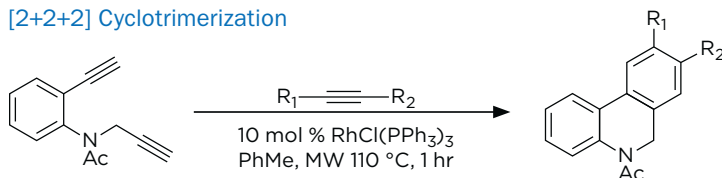


100 mL



Reflux round bottom flasks up to 125 mL

## [2+2+2] Cyclotrimerization



Sripada, L.; Teske, J.A.; Deiters, A. *Org. Biomol. Chem.* **2008**, 6 263-265.

Youg, D. D.; Deiters, A. *Angew. Chem., Int. Ed.* **2007**, 9, 735-738.

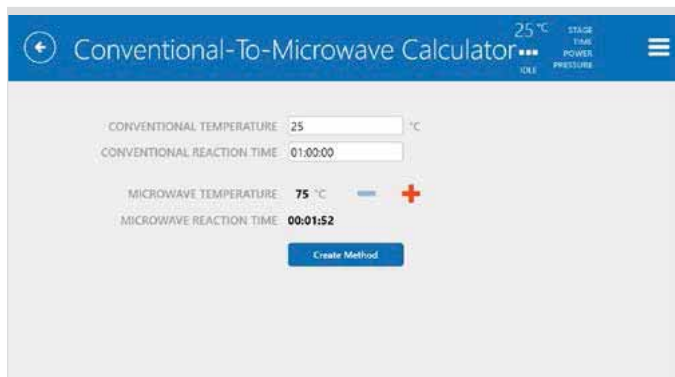
# Reaction Monitoring

The 5 megapixel camera included standard with the Discover 2.0 can be used to record still images or video footage of reactions. Observation is a basic part of science, and this is the perfect tool for documentation and publication support.



# Intuitive Software for Any Chemist

- Fully customizable methods and cycles for any synthetic chemistry
- User level access with full password protection and complete audit trail traceability
- Method import reduces programming errors and allows easy access to niche chemistries



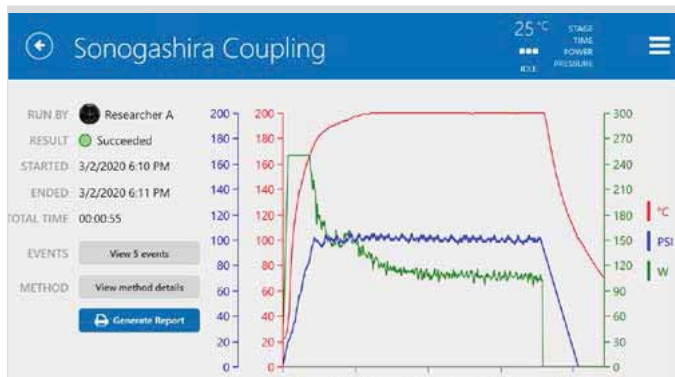
## Create Microwave Methods Directly from Literature

Method programming takes only seconds with the integrated conventional-to-microwave converter. Any standard literature preparation can be automatically changed to a microwave reaction in only a few clicks.



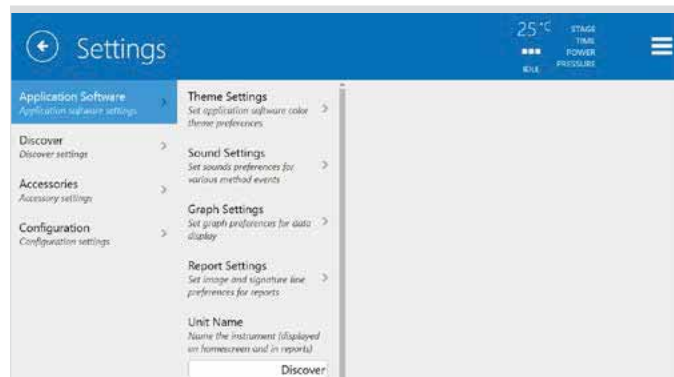
## Complete Control of Your Reaction

The Discover 2.0 features more flexibility in control type than any other microwave synthesizer. Heat to a target temperature quickly and consistently with standard control modes or explore the nature of microwave heating and control reaction pressure with advanced programming.



## Review Data Whenever, Wherever

Generate reports, review data, and export to a local network drive all from the Discover 2.0. No need for a USB to move information to and from the instrument.



## Your Chemistry on Your Instrument

Fully customize all aspects of the Discover 2.0. Power control, method parameters, data management, user logins, color themes, sounds, unit name and many more parameters are all at your fingertips.





## Auto Samplers

### Fully Automated Reaction Handling

Optimize your reactions and expand the capabilities of your laboratory without expanding your lab space. Auto samplers for the Discover 2.0 are available in 12 and 48 position modules, providing fully automated reaction handling capabilities ideal for shared synthesizers and high-throughput labs. Run either 10 or 35 mL vessels, or a combination of both easily. Intelligent rack design allows the auto sampler to recognize the vessel type without user input, and the integrated robotics ensure that switching between 10 mL and 35 mL reaction vessels occurs seamlessly, freeing your time for other things.



## Discover Gas Addition

### Use Gaseous Reagents with Safety and Ease

The Gas Addition accessory is the only system specially designed for single-mode microwave reactions with gaseous reagents. This accessory allows you to pull a vacuum, purge the reaction vessel, and back-fill it with a gas. During the reaction, the gas source is completely shut off from the microwave, thereby ensuring your safety at all times.

Perform hydrogenations, carbonylations, or other reactions with gaseous reagents, or simply use the vessel to ensure an inert atmosphere during microwave irradiation.



## Discover® CoolMate™

### Accelerate Reactions at Sub-ambient Temperatures

The CoolMate is the only commercially available microwave accessory designed to perform reactions at sub-ambient temperatures. Reactions such as lithiations, carbohydrate synthesis, and other temperature-sensitive chemistries can now benefit from the use of microwave energy. Accelerate reactions, even at temperatures as low as -80 °C.



CEM

Discover 2.0

Method 1 of 1  
Experiment 1

132 °C

101 PSI

200 W



132 °C

STAGE 1 of 1

TIME 00:02:03

POWER 200 W

RAMPING

PRESSURE 101 PSI



RAMPING

Stage 1 of 1  
00:02:03





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