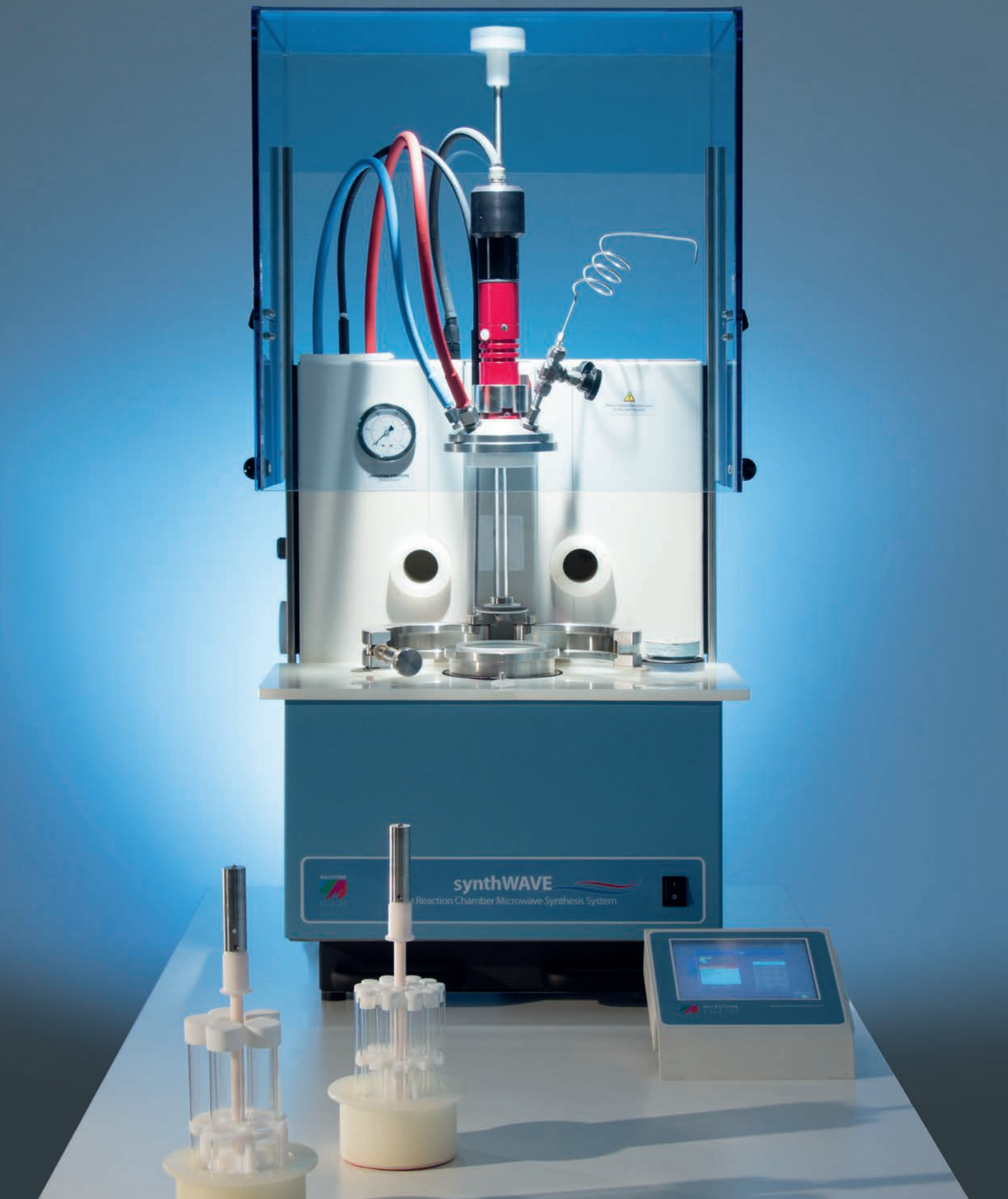
synthWAVE

THE GAME CHANGER IN MICROWAVE SYNTHESIS

MILESTONE
HELPING CHEMISTS



THE BENEFITS OF MICROWAVE TECHNOLOGY

Microwave technology is changing the way to design and optimize synthetic protocols as well as their scaling up to multi-gram production.

The last generation of dedicated microwave reactors enables a fast screening of reaction conditions by means of parallel tests, selecting best catalyst, solvent and conditions.

Since its introduction, it has allowed to run experiments faster than ever before and with higher yield.

Today microwave assisted synthesis has become a cutting-edge technology across the pharmaceutical, biotech, polymers, fine- and agro-chemical industries, with thousands of units installed worldwide.

MILESTONE synthWAVE
The new Milestone synthWAVE is designed for safe, reliable and reproducible scale-up of microwave-enhanced chemical reactions.
It handles single or multiple reactions at temperatures up to 300 °C and pressures to 199 bar.
Small-scale synthesis methods are easily transferred to the synthWAVE.
Incredibly easy to use, the synthWAVE allows the chemist to run large-scale batch and parallel reactions like never before.

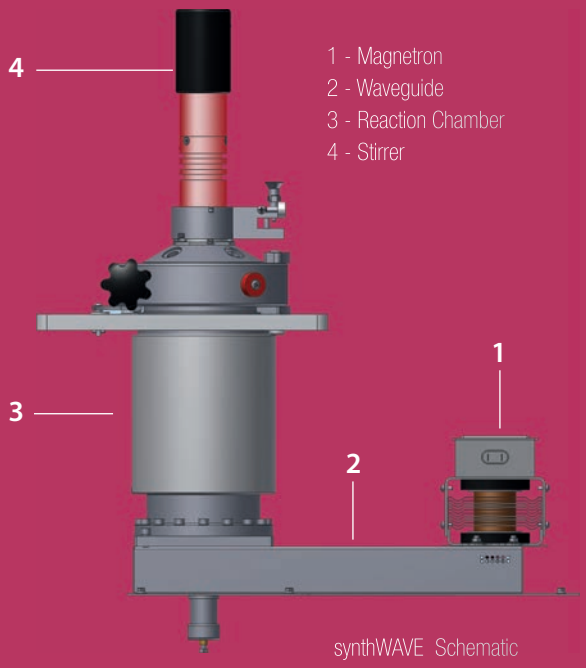
REACTIONS COMPLETED IN MINUTES INSTEAD OF HOURS
ENHANCED SELECTIVITY
IMPROVED YIELDS
LOWER BY-PRODUCTS FORMATION AND SAMPLE CONTAMINATION
REDUCED ENERGY CONSUMPTION
REDUCED QUANTITY OF SAMPLE/CHEMICALS (“ATOM ECONOMY”)

SRC TECHNOLOGY

Milestone's unique Single Reaction Chamber (SRC) technology overcomes the limitations of current microwave synthesis instrumentation.
At the heart of the synthWAVE is a PTFE lined, 1 L stainless steel reaction chamber, which is also the microwave cavity.
This allows the design of the microwave source to be perfectly matched to the cavity shape for optimum microwave distribution and fast, even heating.
The chamber is pre-pressurized with gas to prevent boiling of the solution, and is equipped with mechanical and magnetic stirrers.
The microwave cavity is water cooled, which greatly reduces reaction cooling time and increases productivity.
Reaching up to 300 ºC and 199 bar, the synthWAVE is capable of higher temperature and pressure than any other microwave system.

SAFETY

Like all Milestone products, the synthWAVE has been designed with operator safety of paramount importance.
A thick acrylic shield surrounds the work area, and it lowers into position automatically as the chamber is closed.
A microwave run cannot be started unless the chamber clamp is in position, and the clamp cannot be released until the chamber is cool, and pressure has been released.
The PID controller continuously monitors temperature and pressure, instantaneously adjusting microwave power to control even highly exothermic reactions.



synthWAVE Schematic

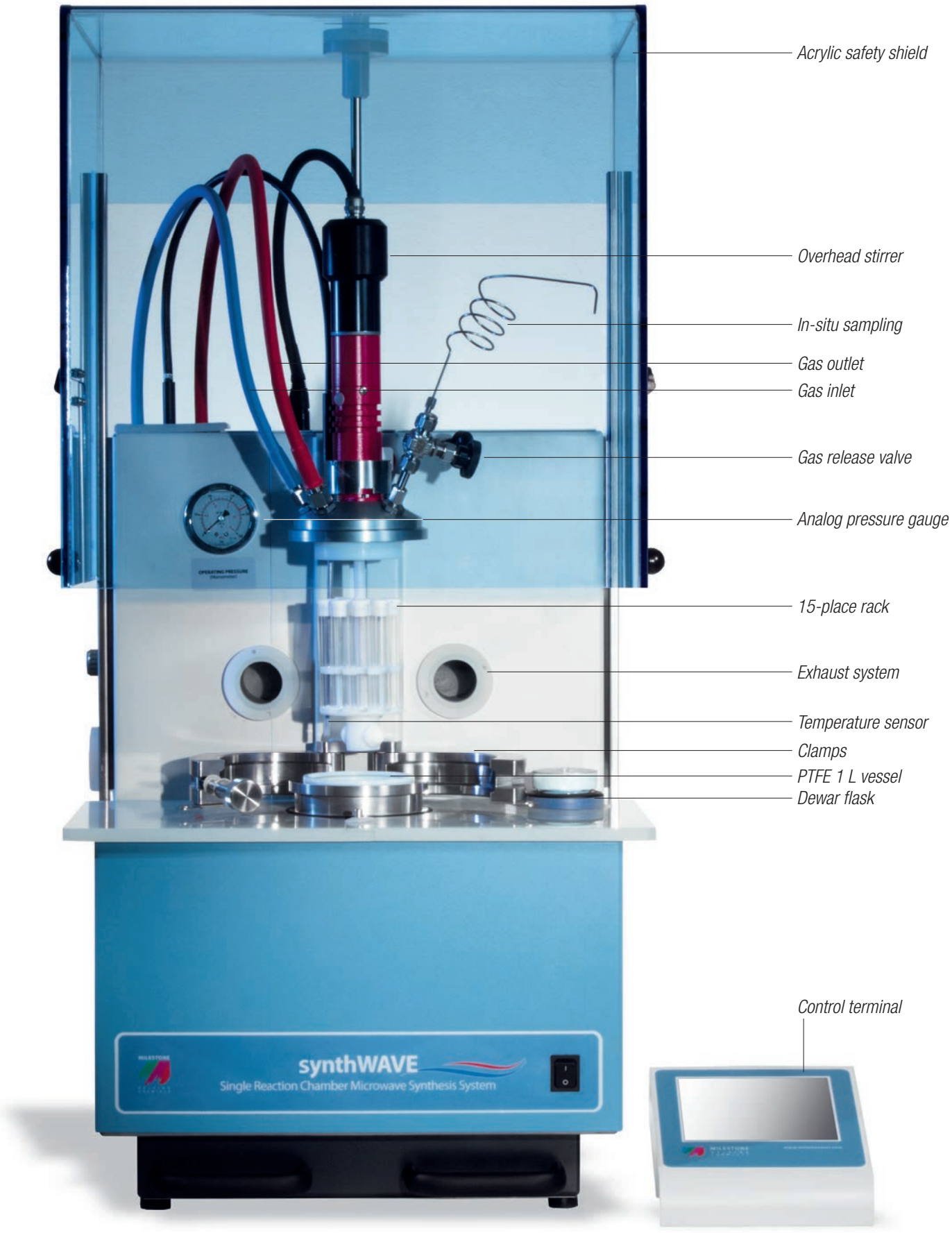
USER INTERFACE

The synthWAVE is controlled via a compact terminal with an easy-to-read, bright, full-colour, touchscreen display.
The terminal is provided with multiple USB and Ethernet ports for interfacing the instrument to external devices and to the local laboratory network.
The terminal runs a completely new user-friendly, icon-driven, multi-language software to provide easy control of the microwave run.
Simply recall a previously stored method or create a new one, press 'START' and the system will automatically follow the user defined temperature utilizing a sophisticated PID algorithm.
Furthermore, all reaction parameters can be modified "on-the-fly", thus assuring the highest flexibility of operation.

SOFTWARE-CONTROLLED STIRRER

The synthWAVE features a powerful stirrer, which ensures vigorous stirring
in the 1L PTFE vessel, or in all vials whenever a rack is used, thus assuring reliable and consistent results.

HOW THE synthWAVE WORKS



FEATURES AND BENEFITS

RACK AND VIALS

Reactions can be carried out directly in the 1L PTFE vessel, or in multiple vials.
Vials are available in glass (disposable), quartz or PTFE, fitted with loose PTFE caps to ensure pressure equalization.
Available rack configurations include 4, 5, 15 and 22 positions.
Numbered rack trays give the operator an easy visual check of vial number.
The synthWAVE sample racks fit easily on a balance, so reagents can be weighed directly into vials already loaded into a rack.
No vessel assembly or disassembly is required, and with the disposable glass vials, no cleaning step is needed, greatly increasing work efficiency.

EASY SAMPLING

Easily and conveniently sample reaction products at any time during the experiment.

EASY SCALE-UP

The combination of high microwave power density of 1.5kW/L and powerful stirring allows the same conditions developed for small-scale reactions to be replicated.

FASTER SCREENING

Multiple reactions are carried out simultaneously under exactly the same temperature and pressure conditions - even using different solvents.
Quickly and easily evaluation of different catalysts, solvents and reaction conditions.

HIGH PRESSURE CAPABILITY

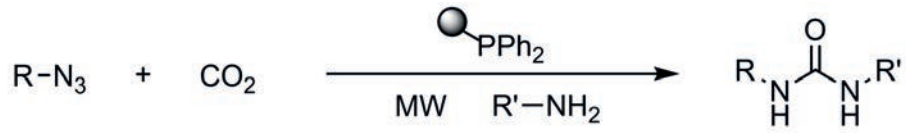
The synthWAVE allows for the use of a wider range of low-boiling reagents, reactants and solvents.
Perform aqueous reactions and extractions below boiling point.
Extremely efficient cooling of the reaction vessel avoids or minimizes degradation and side reactions.

OPERATE IN MODIFIED CONDITIONS

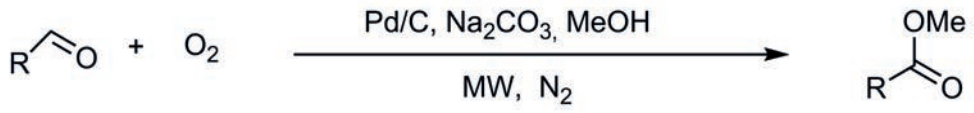
Simply add an inert gas to achieve an inert environment.
Add hydrogen or oxygen to produce a reducing or oxidizing atmosphere respectively.
Speed up reactions with gas molecule insertion using gases such as CO or CO_2.
Example: the preparation of isocyanates derivatives by the Staudinger-Aza-Wittig reaction.

APPLICATIONS

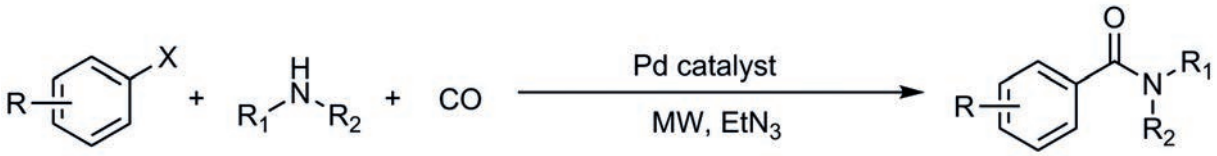
- Oxidations and Reductions
- Esterification & Ammidation
- Coating
- Polymerization
- Nanoparticles preparation
- Modification of carbon nanotubes
- Reactions with sensitive reagents and materials
- Desulphurization
- Cycloadditions
- Reagents and Materials
- Click chemistry
- Gas insertion
- Multicomponent reactions
- Dechlorination
- Subcritical fluids extracion
- Stereoselective transformations
- C-C, C-X Couplings



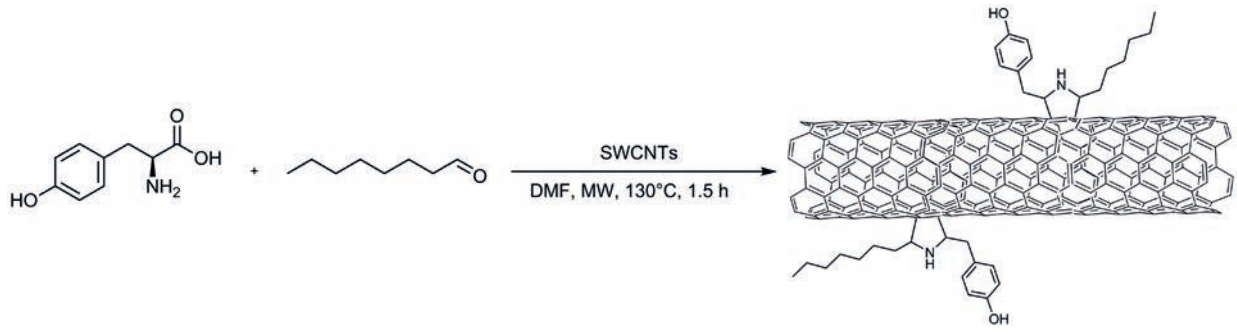
One-pot sequential synthesis of isocyanates and urea derivatives via a microwave-assisted Staudinger–aza- Wittig reaction
D. Carnaroglio et al., Beilstein J. Org. Chem., 2013, 9, 2378-2386



Pd/C-catalyzed aerobic oxidative esterification of alcohols and aldehydes: a highly efficient microwave-assisted green protocol
M. Caporaso et al., Beilstein J. Org. Chem. 2014, 10, 1454–1461



Highly Efficient Microwave-Assisted CO Aminocarbonylation with a Recyclable Pd(II)/TPP-ß-Cyclodextrin Cross-Linked Catalyst
E. Calcio Gaudino et al., Org. Process Res. Dev. 2015, DOI: 10.1021/op5003374



A novel SWCNT platform bearing DOTA and -cyclodextrin units. "One shot" multidecoration under microwave irradiation
E. Calcio Gaudino et al., Org. Biomol. Chem. 2014, 12, 4708- 4715

HELPING CHEMIST

Milestone has been active since 1988 in the field of microwave sample preparation.
With over 20000 instruments installed worldwide, we are the acknowledged industry leader in microwave technology.
Milestone vision is to help chemists by providing the most technologically advanced instrumentation for research and quality control.
Our products offer a wide range of applications, such as microwave acid digestion, solvent extraction, synthesis and ashing.
Furthermore we create products for acid purification and direct mercury determination in solid, liquid and gas samples.
We offer our customers the highest level of application support, building up over the years a relationship based on trust and commitment.

MILESTONE
HELPING CHEMISTS

UNI EN ISO 9001: 2008 CERTIFIED

MILESTONE Srl - Via Fatebenefratelli, 1/5 - 24010 Sorisole (BG) - Italy
Tel: +39 035 573857 - Fax: +39 035 575498
www.milestonesrl.com - email: analytical@milestonesrl.com

MILESTONE INC. - 25 Controls Drive - Shelton, CT 06484 - USA
Tel: (203) 925-4240 - Toll-free: (866) 995-5100 - Fax: (203) 925-4241
www.milestonesci.com - email: mwave@milestonesci.com

MILESTONE GENERAL K.K. - KSP, 3-2-1, Sakado - Takatsu-Ku,
Kawasaki 213-0012 - Japan - Tel: +81 (0)44 850 3811 - Fax: +81 (0)44 819 3036
www.milestone-general.com - email: info@milestone-general.com

MLS GmbH - Auenweg 37 D-88299 Leutkirch im Allgau - Germany
Tel: +49 (0)7561 9818-0 - Fax: +49 (0)7561 9818-12
www.mls-mikrowellen.de - email: mws@mls-mikrowellen.de

CAT333EN-002