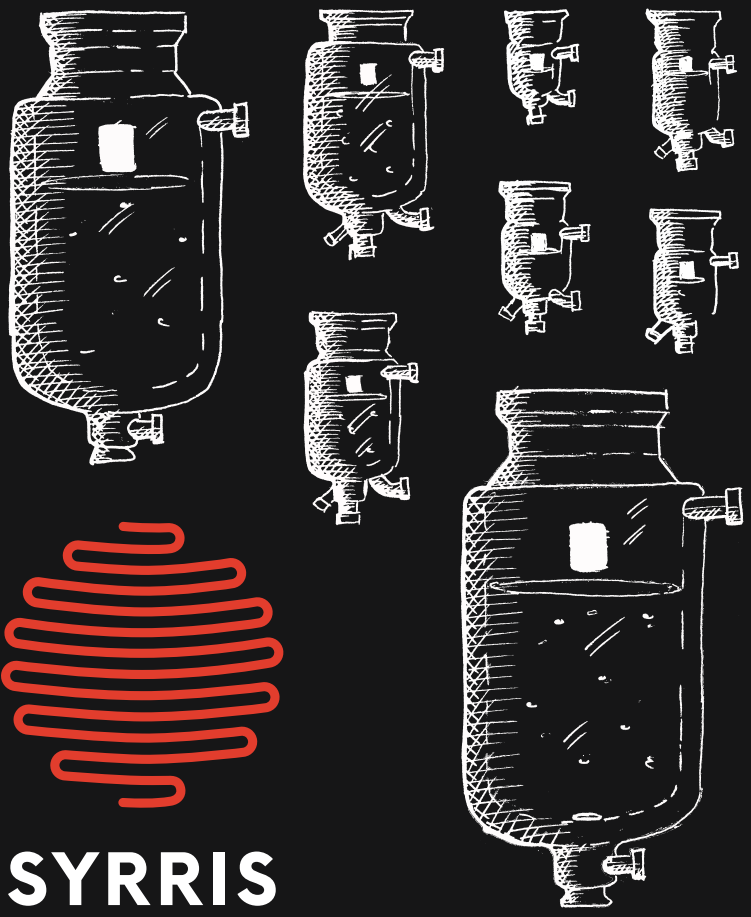

SYRRIS

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Photography by Jon Mold

Syrris batch chemistry

Designed for chemists and chemical engineers, the Syrris range of chemical reactors offers ultimate ease-of-use, flexibility and high performance.

Having been at the forefront of reactor technology for over 15 years, Syrris has developed multiple reactor systems which can be tailored for your specific application. The Atlas HD system combines revolutionary design and superior engineering to offer an automated jacketed reactor platform with supreme flexibility and seamless interchangeability of reactors from 50 mL to 5 L.

With varying levels of automation, the Atlas HD platform can be configured to many applications ranging from pH control to high pressure chemistry to crystallization to reaction calorimetry. The Atlas HD and Chemisens reaction calorimeters offer the choice from an easy to use every day calorimeter to the most sensitive reaction calorimeter on the market.

The Orb system is a manual jacketed reactor system which is proving to be the workhorse in Process Development laboratories around the world. Orb Pilot is the new pilot-scale modular jacketed reactor for scaling up of batch process and offers multiple configurations from 10 to 50 L in one footprint. Full specifications of all product families can be found at syrris.com.

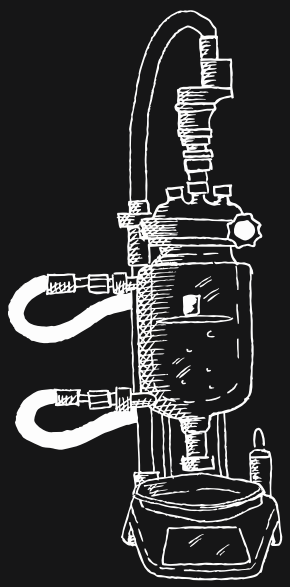
The Syrris batch family

Whatever your application — automated or manual synthesis, scale-up, crystallization, reaction calorimetry and many more — the Syrris range of batch reactors was designed with you in mind.

Specializing in automated and manual jacketed reactor systems with a vessel range from 50 mL through to 50 L, the Syrris batch chemistry family provides solutions from lab scale process development to the scale-up lab. Sophisticated reaction calorimeters, easy-to-use crystallization systems and high-pressure reactor systems ensure that most process requirements are achieved within the range.

The world leader in batch chemistry reactor systems and flow chemistry systems, Syrris takes pride in creating extremely high quality, easy to use automated products for chemists and chemical engineers in pharmaceuticals, academia, CRO, petrochemicals and many other industries.

Which product is right for you and your chemistry? Speak to our team of chemists at syrris.com.

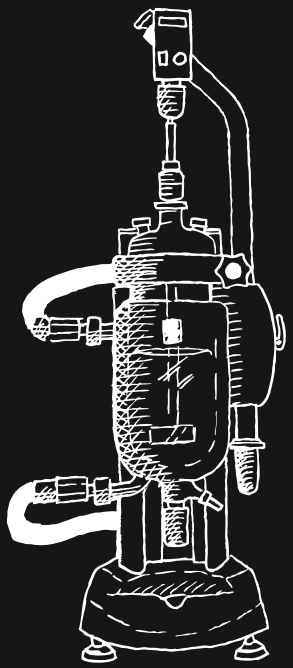


6 Atlas HD

Modular, fully automated chemistry platforms for processes in jacketed reactors.

- 50 mL to 5 L* capacity
- -90 to +250 °C temperature
- Up to 200 bar* pressure

*Flasks, vials and non-jacketed high pressure reactor systems available using Atlas Classic base.



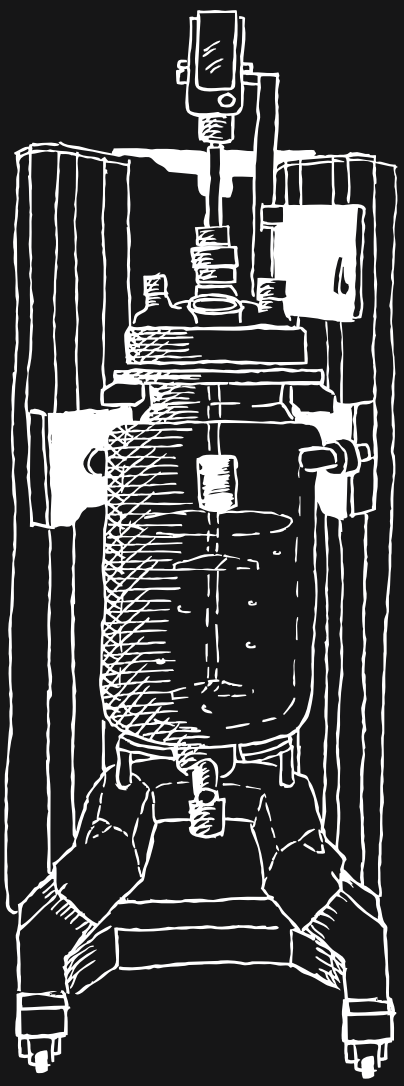
12 Orb

Compact bench-top jacketed reactor system offering superb value, ease-of-use and flexibility.

100 mL to 10 L capacity

-90 to +250 °C temperature

Vacuum to 250 mbar pressure



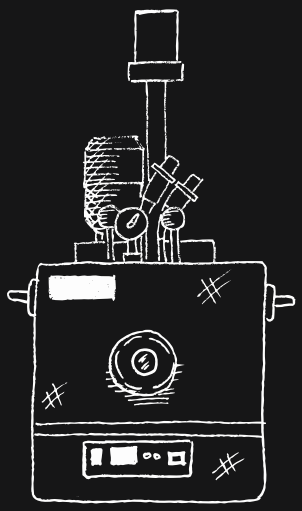
18 Orb Pilot

Floor-standing jacketed reactor system for chemical process scale-up.

10 to 50 L capacity

-40 to +235 °C temperature

Vacuum to 50 mbar pressure



24 Chemisens

Ultra-sensitive, high performance Reaction Calorimeter utilizing True Heat Flow technology

10 to 250 mL capacity

-50 to +200 °C temperature

Vacuum to 100 bar pressure

SYRRIS
Atlas HD

BATCH CHEMISTRY | ATLAS HD

Atlas HD

Atlas HD is an automated, modular jacketed reactor platform for R&D chemists and chemical engineers. Atlas HD enables supreme flexibility with seamless and tool-free interchangeability of jacketed reactors from 50 mL to 5 L.

Atlas HD can be tailored to your chemistry needs with a wide temperature range of -90 to +250 °C, stirring options and pressures from vacuum to 200 bar. A range of sensors including turbidity, temperature, pressure and pH can be configured in addition to automated dosing options using the very successful Atlas Pump.

Building on the success of the much acclaimed Atlas Classic, Atlas HD introduces a built-in, intuitive touch screen which can be used in standalone mode or with PC software for complete experimental control of your process.

Atlas HD is configured into a number of specific applications such as a jacketed reactor platform (Atlas HD Potassium), reaction calorimetry system (Atlas Calorimeter), parallel reactor (Atlas Parallel) and high pressure system (Atlas Sodium 200 bar; Atlas 3 bar).

Atlas HD's stirrer motor simply clicks and locks into place, with no tools or alignment needed.

Applications

Thanks to its innovative design, Atlas HD has systems specifically designed for a wide range of applications, including;

- Process development and optimization.
- Reaction calorimetry using Heat Flow Calorimetry (HFC) and Power Compensation Calorimetry (PCC) techniques.
- Automated dosing control with temperature-dependent dosing.
- pH control and monitoring.
- High pressure synthesis.
- Crystallization and many more.

The Atlas HD range of systems offer total flexibility to suit your chemists; vary the vessel size in minutes and change any parameter such as temperature, stirring and dosing on-the-fly using either the touch screen or PC software.

Full specifications at syrris.com/atlas-hd

1 Intuitive touch screen base for complete experimental control.
2 Quick clamp system for tool-free vessel changes.
3 Scorpion overhead stirrer offering speeds up to 800 rpm. High-speed and high-torque stirrer motors available.
4 Turbidity, pH and temperature probes available.
5 50 mL to 5 L vessels in a range of profiles including torispherical, round-bottomed and conical.
6 A range of PTFE and steel stirrers available.
7 Spring-loaded BOV for leak-free chemistry.

50 mL to 5 L* capacity

-90 to +250 °C temperature

Up to 200 bar* pressure

BATCH CHEMISTRY | ATLAS HD

> "We purchased two Atlas systems and are delighted with their performance, ease-of-use and flexibility"
>
> Dr. David Easson, VP Manufacturing and Process Development, Epic Therapeutics, Baxter Healthcare — USA

*Flasks, vials and non-jacketed high pressure reactor systems available using Atlas Classic base.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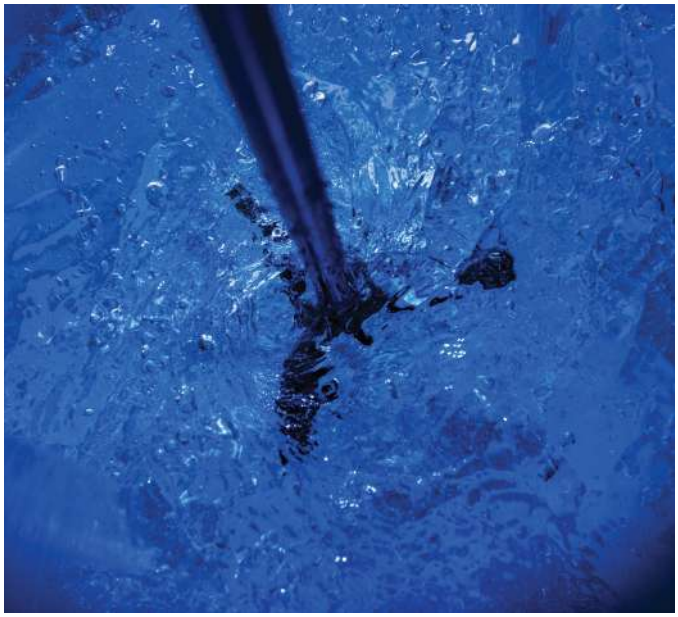
Easy to use Reaction Calorimetry

- Easy-to-use Reaction Calorimeter
- Generate power and enthalpy graphs quickly

The Atlas HD Calorimeter is an easy-to-use, high performance system. Using either Heat Flow Calorimetry (HFC) or Power Compensation Calorimetry (PCC), Atlas HD can generate power and enthalpy graphs quickly and easily.

The simple configuration of reaction temperatures, dosing and alarms provides researchers with a safe and accurate calorimetry system. All Atlas HD systems can be upgraded to perform reaction calorimetry proving that Atlas HD is the most versatile platform on the market.



Intuitive Touch Screen Control

- Fully automated
- Full data capture
- Stand alone or with PC software

The Atlas HD intuitive touch screen allows plug and play configuration by simply connecting circulators, stirrers, probes and Atlas Pumps. All data is captured and real-time graphical data is displayed directly on the screen. The system allows changes to be made on-the-fly during a reaction by simply changing parameters on the base. The Atlas PC Software can also be used for advanced experimental control.

Changing the reactor

<2 minutes to change a vessel

1 Raise the quick release connection on the scorpion stirrer motor to release it from the stirrer seal and guide and place the motor into its holder.

2 Simply unscrew the oil pipes from the vessel and attach them to the oil pipe tidy on the Atlas HD frame.

3 Undo the quick clamp release by turning the knob counter-clockwise. The vessel and lid will be released but kept fully supported.

4 Remove the lid if desired and then rotate the vessel in place to escape the clamp and remove.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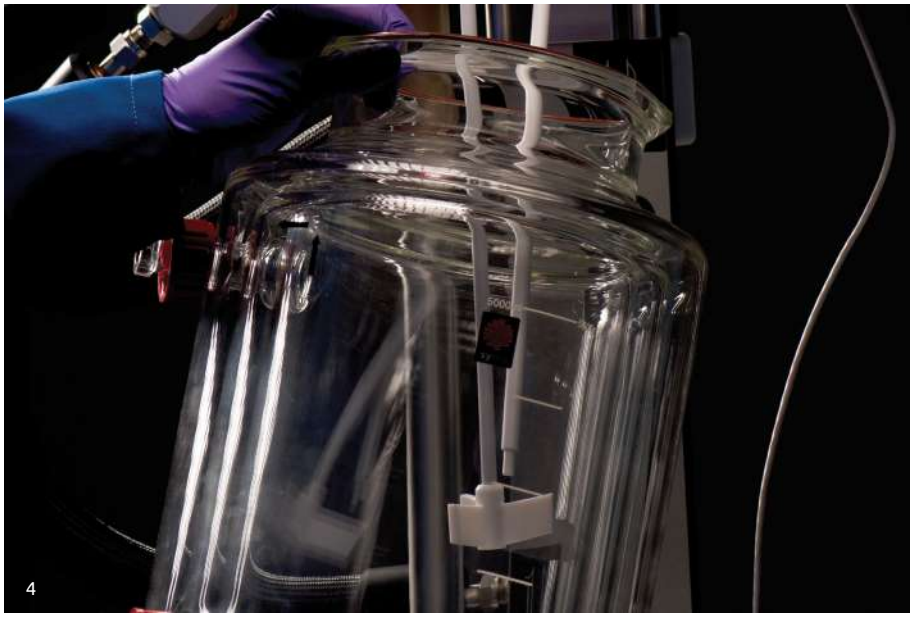
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SYRRIS
Orb

BATCH CHEMISTRY | ORB

Orb

Orb is a compact bench-top jacketed reactor system combining excellent value and high quality construction with unique user-friendly features and reliable performance.

Designed for daily use, Orb's intuitive and thoughtful design makes using jacketed reactors easy. Orb offers rapid height adjustment and two clamp sizes to accommodate a wide range of vessels from 100 mL to 10 L which can be interchanged quickly. The system can be used over a wide temperature range and is a true chemistry lab workhorse. A wide selection of accessories and upgrades for automation are available.

With the ever increasing demands on cost, Orb was designed specifically to be very attractive in price. Speak to a Syrris representative and you will be amazed at the cost of Orb.

Orb's quick clamp system and tool-free height adjustment offers multiple reactor setups in one footprint.

Applications

Due to its modular design, wide vessel range and wide temperature limits, Orb can be used in many applications including process development and optimization, advanced synthesis, crystallization, automated synthesis* and more.

Customization options

Orb's modular design allows it to be configured with vessels from 100 mL to 10 L in a range of profiles and offers a wide choice of stirrers and motors. Orb can be upgraded to perform automated experiments without the requirement of a PC. The optional Reactor Master module automates temperature, stirring speed and dosing with full data logging capabilities.

Full specifications at syrris.com/orb

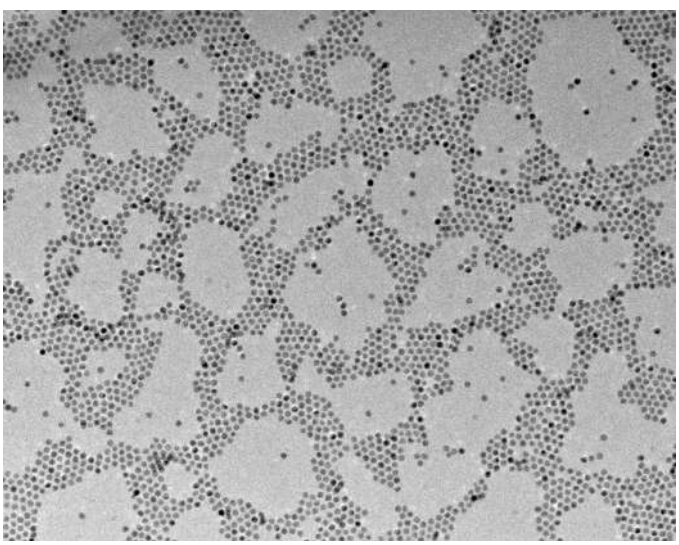
1. Multiple stirring motor options with a choice of high speed (up to 2000 rpm), high torque (up to 90 Ncm), torque feedback and RS232 control.
2. Easily lift the stirrer motor and move out of the way.
3. Tool-free clamping system offers rapid vessel changes with no risk to the glassware.
4. Orb boasts a solid base and easily removable drip tray.
5. Wide vessel range from 100 mL through to 10 L in a range of profiles.

100 mL to 10 L capacity

-90 to +250 °C temperature

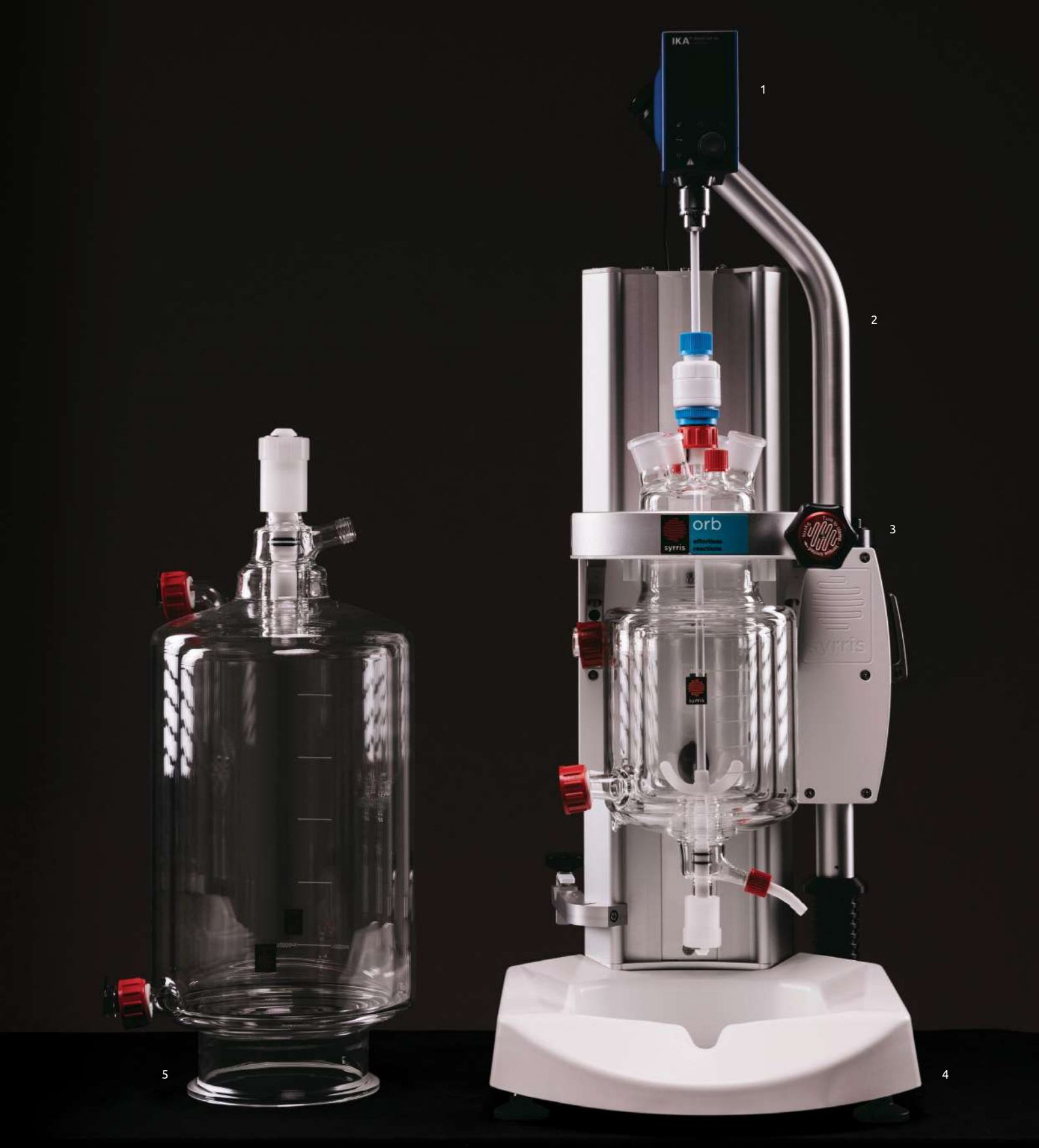
Vacuum to 250 mbar pressure

> **"The Orb system is compact, robust and very simple to operate. My Masters and Doctoral students already have full autonomy to use the system. We are using it for the synthesis of gold nanoparticles (AuNPs) capped with different chemical binders. In the past, we used to have repeatability issues using flasks and magnetic stirring. With the Orb system, this problem no longer exists and the research group is fully satisfied with its performance."**
>
> Prof. Dr. Ricardo Queiroz Aucélio, Pontifícia Universidade Católica—Rio de Janeiro



Gold Nanoparticles Dodecanethiol Coated—5.5nm
Synthesized in Orb by Dr. Pavel Abdulkin

*With automation upgrade


IKA
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orb
syrris
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The easiest jacketed reactor you will ever use at an amazing price

We designed Orb to be the easiest jacketed reactor you will ever use, with a range of clever ease-of-use features built in.

1 The quick clamp system offers tool-free vessel changes in a matter of minutes. Simply rotate the toque-limited knob, open the clamp, lift off the lid and remove the vessel.
2 Orb's working height is easily adjusted by pulling the quick release knob and sliding the frame up or down. Pre-set heights are built into the frame for convenience.
3 Using the stirrer motor arm, Orb's stirrer motor is easily lifted and moved out of the way without reaching up above the reactor.
4 Orb's vessels offer quick, clean and tool-free oil pipe connections. Oil pipes can be stowed away on the frame's oil pipe tidy when not in use.

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SYRRIS
Orb Pilot
50L
50L
syrris

Orb Pilot

Orb Pilot is the most flexible and versatile floor standing jacketed reactor system for scaling up of batch processes. Designed from the ground up with the help of scale-up chemists and chemical engineers, Orb Pilot boasts a wealth of user-friendly features such as quick vessel changes, easy height adjustments and a self-adjusting spring-loaded base frame.

Benefitting from a wide vessel range of 10 to 50 L in a range of profiles, powerful stirrer motors and a selection of PTFE and stainless steel stirrers, Orb Pilot is easily configured to match your exact requirements. Orb Pilot truly provides multiple reactor setups in one footprint.

Designed to combat the usual issues experienced with scale-up reactors—inflexibility and high cost—Orb Pilot offers vessel changes in under an hour and a tailored solution for the same cost as other readily available fixed reactors.

The combination of baffles and stirrer options offers unrivalled mixing performance.

Applications

Designed specifically for chemical process scale-up, Orb Pilot can be used for a range of scale-up chemistry applications, including chemical synthesis, crystallization and precipitation, reaction kinetics studies, chemical process safety and many more.

Full specifications at syrris.com/orb-pilot

1. High-efficiency 3500cm² double coil and jacketed condenser, suitable for the most demanding applications.
2. Multiple stirring options available including high-power stirrer motors, up to 800 rpm and 400 N/cm torque and optional remote control for convenience.
3. Oil pipe supports avoid any undue strain on the vessel by supporting the weight of your circulator oil pipes.
4. Wide vessel range spanning 10 to 50 L in a range of jacketed and vacuum jacketed profiles.
5. Self-adjusting base frame adjusts to whichever vessel you attach and supports up to 90% of the vessel's mass, avoiding unnecessary strain on the vessel neck.
6. Orb Pilot's removable baffles ensure your reactions experience superior mixing.
7. Combined castors and levelling feet offer easy handling and secure positioning.

10 to 50 L capacity

-40 to +235 °C temperature

Vacuum to 50 mbar pressure

"Chemists and chemical engineers told us they feel restricted when using scale-up chemistry equipment. Hours or even days to change vessels, poor mixing ability, a lack of useful vessel sizes and high costs.

We wanted to change the face of scale-up chemistry reactors—Orb Pilot is the result.

Designed from the ground up, Orb Pilot addresses all the main pain points chemists and chemical engineers like you experience."

Oliver Sowerby,
Head of Product Design


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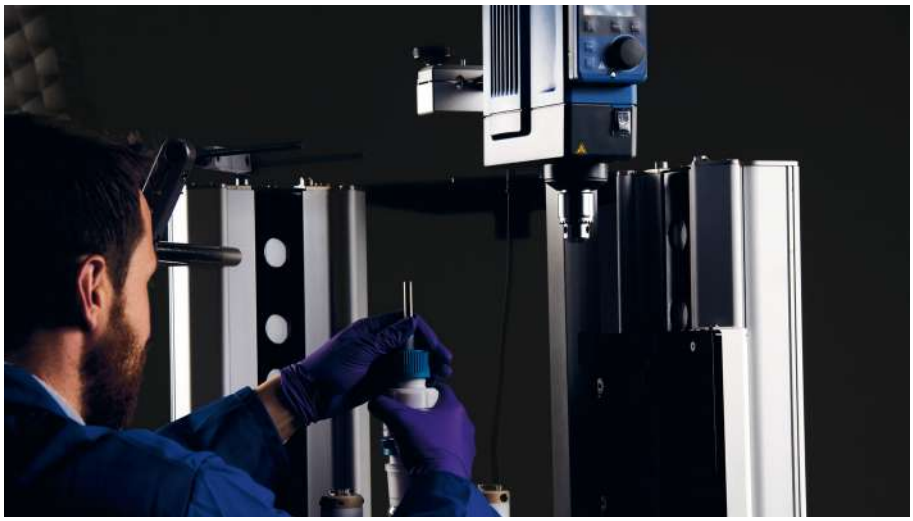
Changing a Vessel

<1 hour to change a vessel

Quick and easy vessel changes is one of Orb Pilot's crowning features and follows the same ease-of-use principles that we apply to our lab scale chemistry products. Pre-set height adjustments on the frame provide easy vessel height changes, while the spring-loaded self-adjusting base frame ensures a perfect vessel fit every time.



Disconnect the stirrer motor from the stirrer and easily lift and rotate the motor out of the way using its supporting arm.

Simply unscrew and remove the stirring baffles from the lid, loosen the stirrer sealing guide and slide the stirrer up to the top of the vessel.

Undo the force-limited vessel clamps to release the vessel from the neck clamp. Remove the vessel lid and neck clamp and unhook the base frame clamp. The vessel will remain in place.

Rotate the vessel and lift it up and out to complete the process. The spring-loaded base will assist in supporting the vessel.

SYRRIS
Chemisens

BATCH CHEMISTRY | CHEMISENS

Reaction Calorimetry with Chemisens

The Chemisens Reaction Calorimeter is the most sophisticated and accurate reaction calorimeter available. The system operates using the highly innovative True Heat Flow Calorimetry Measurement technology to enable real-time analysis of the process.

True Heat Flow Calorimetry measurement requires no calibration pre- or post- experiment; a distinct advantage over other reaction calorimeters and saves a lot of time per experiment. Due to the novel measurement technology, the system boasts ultra-sensitivity with power measurement better than ±0.0001W.

True Heat Flow measurements are extremely advantageous for processes at reflux, those involving phase changes such as polymerization or those requiring high pressures. The design of the reactor ensures experiments can proceed with extremely small reactor volumes (10 to 250 mL) resulting in low raw material consumption, minimized waste and reduced experiment times.

The Chemisens Reaction Calorimeter software control is simple and easy to configure and analyse. It is equipped with many in-built safety considerations making the system the ultimate choice for reaction calorimetry.

Applications

With multiple thermal modes and unrivalled sensitivity, the system is ideal for numerous applications including:

- Scale-up process safety
- Reflux calorimetry
- Polymerization studies
- High pressure calorimetry
- Reaction kinetics
- Processes involving multiple phases and phase changes

Full specifications at syrris.com/chemisens

1 Calorimeter with bath for temperature stability and double glassed window viewport.
2 Overhead stirring from 50 rpm to 2000 rpm with a maximum torque of 0.1 N/m.
3 Measurement and logging of multiple parameters in real time (heat flow, power, reaction temperature, adiabatic temperature rise, heat capacity, enthalpy, etc.).
4 Easy-to-use PC software allows advanced control of experiments with real-time measuring, storing and display of data.
5 The Chemisens Controller provides basic calorimetry, process and safety functions.

10 to 250 mL capacity

-50 to +200 °C temperature

Vacuum to 100 bar pressure

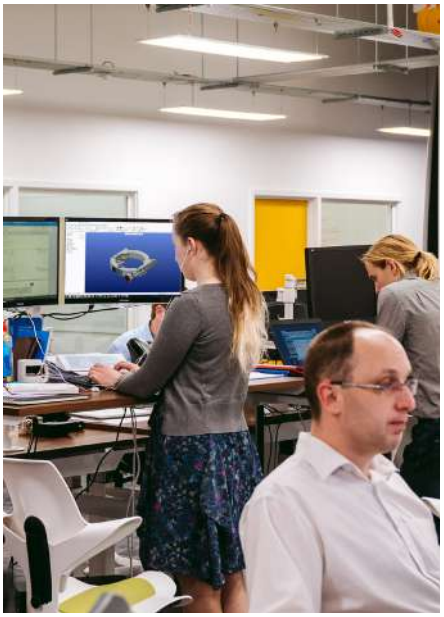
Need more detailed information or technical specifications? Discover more at syrris.com or speak to our team of chemists.

Meet the team

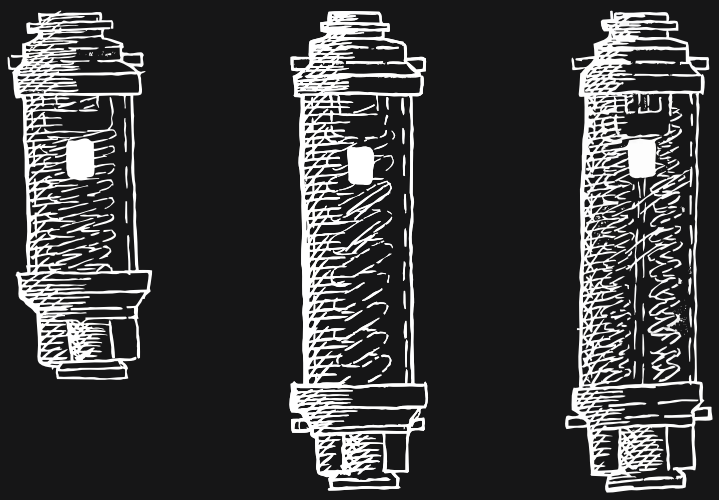
Stuart Simcock
Product Manager
A time served scientific glassblower who spent much of his career working with the agrochemical industry supporting discovery, development and manufacturing disciplines. Stuart managed a glass blowing company specializing in scientific glassware. Stuart has a wealth of knowledge in reactor technology and is the Product Manager for Syrris' reactor platforms.

Philip Podmore
Head of Support
Before working for Syrris, Philip gained a 1st class degree from the University of Greenwich. He then went on to work in the chemistry department at the University of Cambridge for seven years before joining the technology and high pressure chemistry department at Pfizer. Phil has worked with flow chemistry since 2005 and has been the batch product specialist at Syrris since 2012.

Find us online



Discover a wealth of product information and technical specifications, application notes, case studies and customer testimonials at syrris.com.



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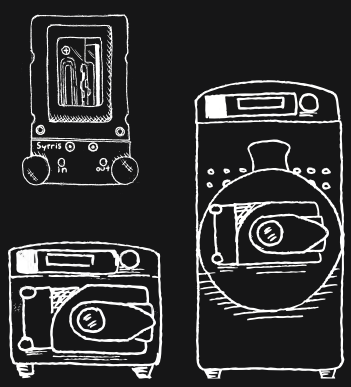

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Photography by Jon Mold

Syrris flow chemistry

Flow chemistry is a fast growing and exciting technology providing numerous benefits to chemists over traditional batch techniques. Chemical reactions can be faster, cleaner, more selective and reproducible.

A big advantage of flow chemistry is that scale up is more seamless due to maintaining excellent mixing and heat transfer. In addition, many chemical processes may proceed which are just not possible by other techniques.

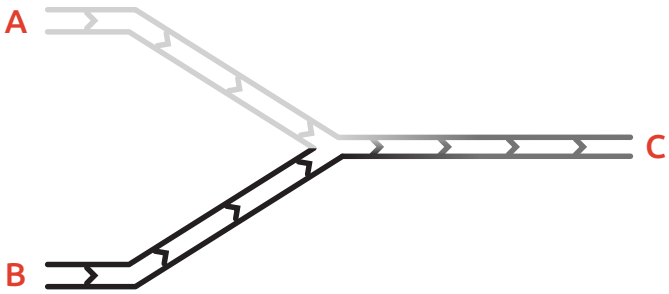
Syrris provides flexible, modular systems designed for R&D laboratories through to robust platforms designed for chemical process scale up.

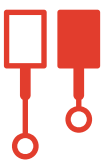
Syrris has been at the forefront of the growth of the flow chemistry market. As the world's longest established provider, Syrris has won prestigious R&D awards for their flow chemistry systems and support leading industrial and academic chemists and engineers around the globe.

About flow chemistry

Flow chemistry, sometimes referred to as plug flow microchemistry or continuous flow chemistry, is the process of performing chemical reactions in a continuous tube or pipe. Reagents are pumped together at a mixing junction and the flow continues down a temperature controlled tube or pipe.

The ratio of the reactants are controlled by their concentrations and relative flow rates. The rapid mixing and large surface area to volume ratio provides excellent reproducibility and control of a chemical process.



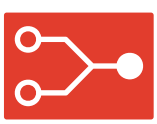


Syringe Pump

Pumps are potentially the most important part of a flow chemistry system. Without confidence in pumping accuracy and performance many of the advantages of flow chemistry are lost.

Pressure

The ability to apply pressure to a flow chemistry reaction is a major benefit of using the technique. Pressure allows superheating of the reaction mixture which can dramatically increase reaction time. Applying pressure can also control reactions that involve gas or where gas is added as a reactant.



Microreactor

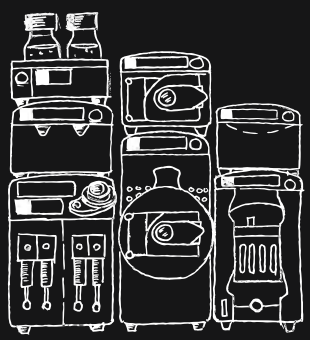
Flow chemistry reactors need to be as versatile as possible to cover the greatest range of reaction conditions. Reactors should be flexible in volume to allow a large range of residence times, provide excellent mixing/heat transfer and offer good visibility where possible. Reactors also need the ability to perform different types of homo/ heterogeneous chemistry.

Product Collector

The unique properties of flow chemistry allow as much material as required to be collected without the restriction of reactor size. Small amounts can be collected for reaction optimization and larger quantities for scale up applications.

The Syrris flow family

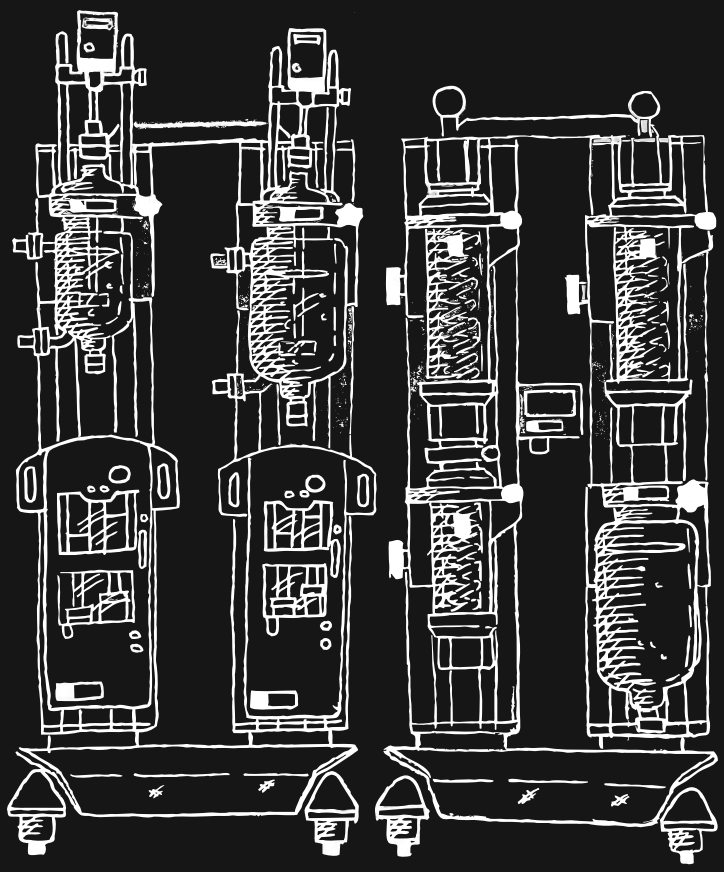
The Syrris flow chemistry product range spans scales from the lab through the pilot plant to manufacturing.



32 Asia

Modular, lab-scale flow chemistry systems.

- 1 µL/min to 10 mL/min flow rate*
- -100 to +250 °C temperature
- Up to 20 bar pressure



40 Titan

Large scale, modular continuous flow systems.

- 1 to 250 mL/min flow rate*
- -40 to +250 °C temperature
- Up to 20 bar pressure

*Per pump channel


SYRRIS
Asia
Syrris
Out
2012
R&D
100
FLOW CHEMISTRY | ASIA

Asia

Asia is a revolutionary range of advanced flow chemistry products. It has been designed by chemists for chemists to enable the widest variety of chemical reactions and ultimate ease of use.

Asia offers a variety of flow chemistry modules and systems in either entry level or advanced configurations for both beginners with modest budgets and experts who demand the utmost functionality.

The modular nature allows you to be flexible with your application and adapt the system configuration to suit the needs of your chemical process. With other systems suitable for entry level and teaching applications, the Asia system is the ideal choice for R&D laboratory chemists.

Winner of the R&D 100 award which celebrates innovative technology and is a benchmark of excellence.

Benefits

Asia is unique. It can be configured specifically to your chemistry making the system a vital asset in any R&D laboratory.

- Perform a wider range of chemistries.
- Flexible to meet chemists' needs (and budgets).
- Integration of synthesis, work-up and analysis.
- Safer and cleaner reactions.
- More reactions in less time.
- Maximum chemical resistance.
- Robust and easy to use.

Full specifications at syrris.com/asia

1 Automated introduction of reagents for complete walk-away synthesis.
2 Pressurized inputs allows air sensitive chemistry and enables smooth flow.
3 Inject small quantities of reagents into flowing stream using the Reagent Injector.
4 Microreactor control from -15 to +150 °C.
5 Input variable back pressure post reaction up to 20 bar.
6 Extra smooth flow rates from 1 µL/min to 10 mL/min per pump channel.
7 Cool reactions to -100 °C (microreactors) or -70 °C (tube reactors).
8 Heat reactions from ambient to +250 °C.
9 Enable on-line reaction analysis using LCMS, HPLC or UPLC.
10 Connect all modules to the Automator for complete control using PC software.

1 µL/min to 10 mL/min flow rate per pump channel

-100 to +250 °C temperature

Up to 20 bar pressure

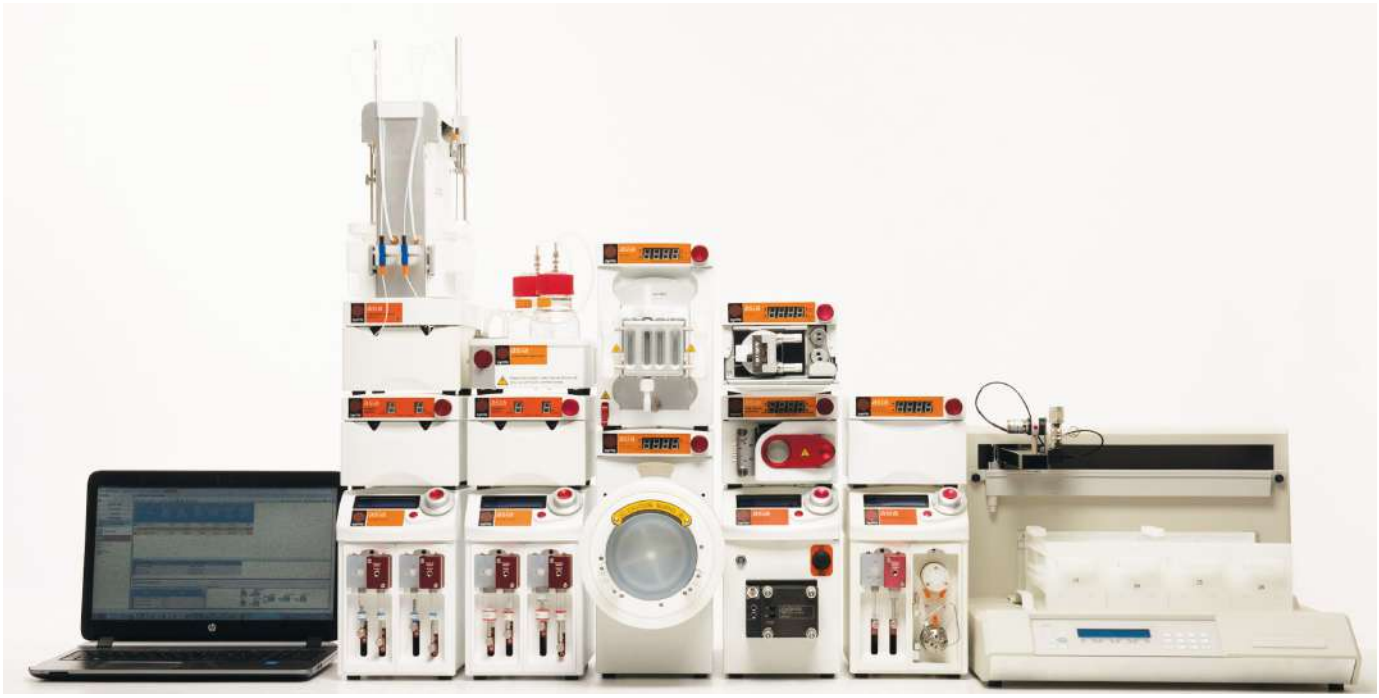
“At Syrris, we have a very simple philosophy—our products are designed for chemists like you and the way you work.”

Mark Gilligan, CEO

Asia systems

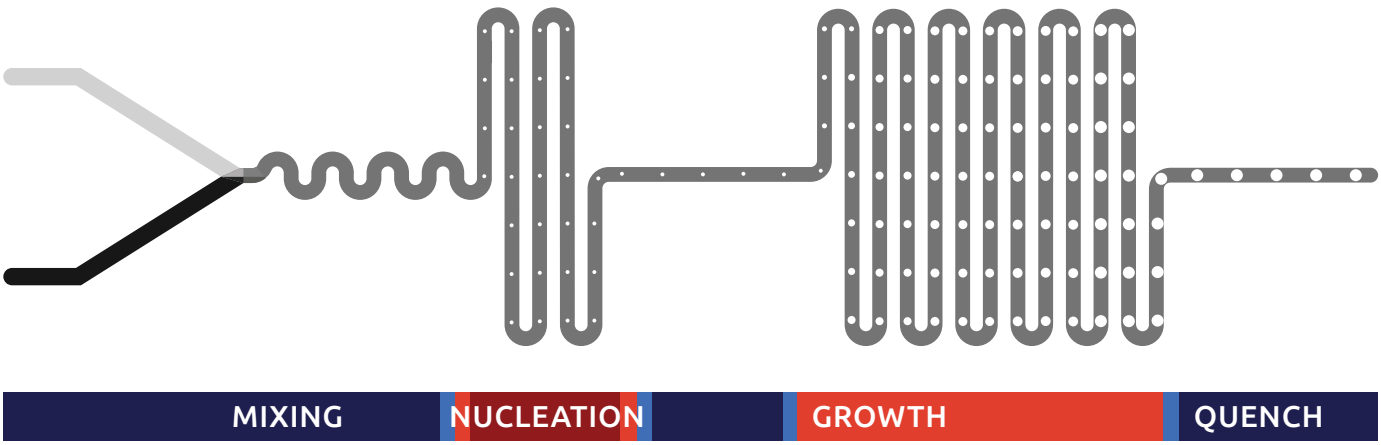
Asia is a modular system. All the Asia modules can be supplied separately or can be configured to suit the needs of your chemistry. An example of some pre-configured systems are shown below. Speak to one of our flow chemistry team to discuss the system you desire.

- Starter system
- Scale-up system
- Nanoparticle system
- Electrochemistry system
- Discovery chemistry system
- Premium system



An interview with Dr. Tom Jellicoe

EPSRC CDT in Nanoscience and Nanotechnology (NanoDTC)
University of Cambridge

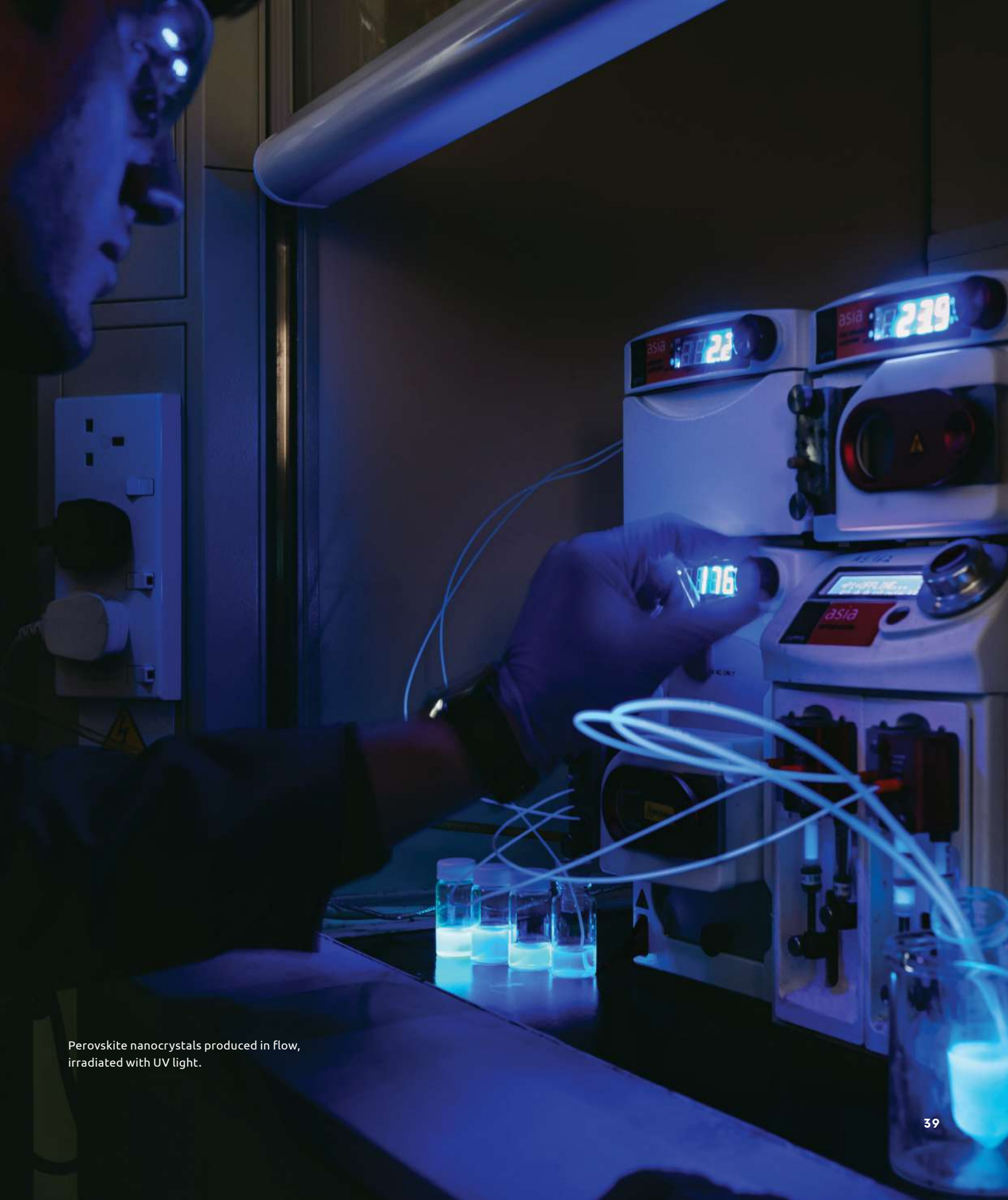


"The growth of quantum dots is susceptible to minute changes in reaction conditions, the unique control that flow chemistry permits gave me precise and repeatable quantum dot growth.

Many nanomaterials exhibit remarkable size-dependent properties which vary profoundly when the dimensions of the particle are varied on the nanometre scale. As such, it is necessary to ensure, as much as possible, that all nanoparticles within a sample are the same size (monodisperse) to maximize usefulness in applications.

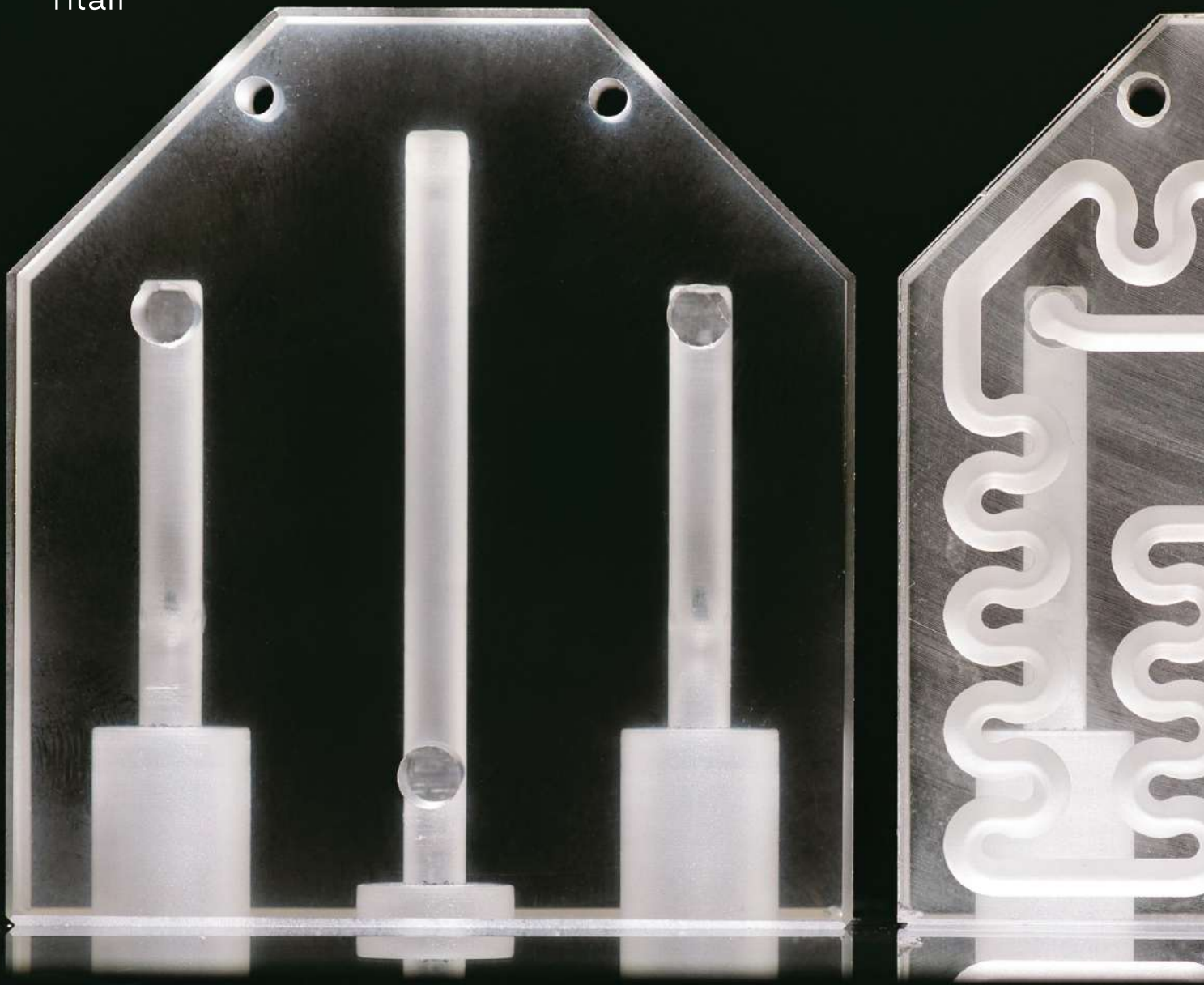
In the case of perovskite nanocrystals I was able to control the monodispersity with great precision and repeatability. Owing to the great deal of control of the reaction conditions Asia provided, all particles had similar growth history."

Tom Jellicoe is a quantum dot specialist concerned with development and production of nanoparticles. Tom holds a first class Masters in Chemistry with Nanotechnology from the University of Liverpool and a PhD in Physics (Optoelectronics) from the University of Cambridge. His doctoral research concerned the development of quantum dots for next generation solar cells and LEDs. Tom continued this research as a post-doctoral Research Associate in the NanoDTC group with Prof. Sir Richard Friend, Prof. Neil Greenham and Dr. Akshay Rao. He has experience in optimization of quantum dot syntheses, development of novel nanoparticle materials and commercialization of quantum dot research. Tom has won a number of prizes for research including the Zing nanocrystals prize in 2013 and the Royal Society of Chemistry, Chemistry World student prize in 2015.



Perovskite nanocrystals produced in flow, irradiated with UV light.

SYRRIS
Titan



FLOW CHEMISTRY | TITAN

Titan

Titan is a revolutionary continuous chemical processing system that enables seamless scale-up from kilo lab through to pilot plant and manufacturing.

Titan provides a complete solution for developing and scaling your continuous flow processes. It is designed to be assembled into a large range of different configurations in a short time period, requiring minimal tooling. The array of modules available are completely interoperable and can be set up to work with your application without the need to engineer parts and connections.

Syrris' award winning R&D team have utilized the expertise in microfluidics and glass fabrication with great design to enable a series of reactors capable of working with ultra-fast to slow reaction times.

Benefits

Titan is revolutionary—the only complete system to address the scale-up of continuous processes. Titan's development has been built on Syrris' many years of experience of the flow chemistry market.

- Complete turn-key system for development and scale-up.
- Reliable and robust, designed for long term use in manufacturing environments.
- Highly flexible and modular.
- High performance and ideally suited for high mass transfer and heat transfer processes.
- Scalable by adding or removing modules to achieve the desired output of the process.
- Extremely high chemical resistance.
- Easy to use and assemble with minimal tools.

Full specifications at syrris.com/titan

1 Temperature controlled Reagent Stores.
2 Syringe pump with smooth flow rates from 1 to 250 mL/min.
3 Pre-Heat Exchange Reactor to ensure reagents reach reaction temperature.
4 Rigid Intermodule Connector for seamless connection of all reactors.
5 Fast Mixing Injector (FMI) for high mass transfer.
6 Residence Time Unit (RTU).
7 Post reaction back pressure regulator.
8 Product Collection up to 50 L.

1 to 250 mL/min flow rate per pump channel

-40 to +250 °C temperature

Up to 20 bar pressure

> "Our vision has been to revolutionize flow chemistry and offer complete continuous processing solutions from lab scale through to manufacture. The future of continuous flow scale-up is finally here with the release of Titan."
>
> Dr. Omar Jina, CCO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Titan systems

Regardless of scale, each Titan system is comprised of the same modules. Modularity is at the heart of the design of Titan. This means that if you change your chemistry, scale or process, Titan can be changed to suit.

The key modules of the system (pump, reactor, stores and collection vessels) can be combined in series and in increasing levels of complexity to create any system from benchtop lab-scale through to full manufacturing.

Syrris' design philosophy of ease of use has been considered throughout the development of Titan. All modules have been developed to require minimal use of tools and removal and adjustment of module positions can be done in minutes.

- Lab scale system
- Pilot plant system
- Manufacturing scale system

Syringe Pump

The Titan Syringe Pump is the first pump on the market developed specifically for large scale continuous processing. It has been designed for safe and reliable scale-up and offers ultra-smooth fluid flow for lab, pilot plant and production scale applications.

Powerful drive motors and innovative valve design have been combined with software control to deliver flow rates from 1 to 250 mL/min up to 20 bar with solutions of viscosities up to 1000 cP.

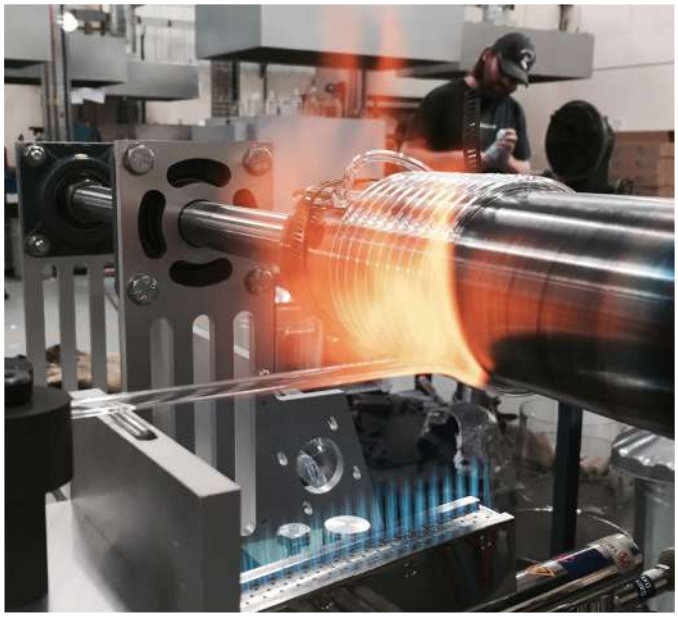
The novel syringe cassette is designed for seamless interchange. It also allows seals to be replaced with minimal use of tools. Pressure sensors, safety door, lock-out tags and connectivity to 3rd party E-stop hardware ensures a safe working environment.

Reactors

Titan features various reactor modules that can be quickly connected together to create single- or multi-step and multi-temperature zone reactors.

The different types of reactor include:

- Pre-Reaction Heat Exchanger to heat or cool reagents prior to the reaction.
- Fast Mixing Injector (FMI) has been designed for fast reactions requiring extremely high mass transfer and heat transfer.
- Residence Time Unit (RTU) offers excellent temperature control for the desired residence time of the reaction. Reactor volumes of 64 and 250 mL with the ability to connect multiple RTU's to achieve the desired reactor volume to suit the process.
- Post-Reaction Heat Exchanger to heat or cool the reaction back to near ambient temperature.



Rigid Intermodule Connector

A key component of the Titan Reactors is the Rigid Intermodule Connector (RIC). These come in a range of designs to allow straight-forward reconfiguration of an entire system. Designs range from Fast Mixing Injector RICs, which incorporate micromixer technology, to simple mixer RICs, straight-through RICs and Sampler/Injector RICs. These components feature patent-pending seals and temperature monitoring.

Titan Framework and Reagent Stores

Titan has numerous accessories including Framework, Reagent Stores and Product Collectors. The framework is designed to enable easy mounting of pumps, reactors, feed vessels and all other modules. The frame is modular and several frames can be quickly clipped together to allow seamless scaling of your Titan system. The frame is designed to fit into a walk-in fumehood and has integrated electrical and communications cables.

Temperature controlled Reagent Stores and Product Collectors from 1 to 50 L can be stirred prior to introduction to the continuous process.

Need more detailed information or technical specifications? Discover more at syrris.com or speak to our team of chemists.

Meet the team

Andrew Mansfield
Product Manager
Andrew has many years of experience as a Research Chemist for Pfizer in the pharmaceutical industry gaining expert knowledge in flow chemistry and medicinal chemistry. Andrew is the Syrris product manager for lab scale flow chemistry systems and is our in-house expert for flow chemistry applications.

Dr. Andrew Lovatt
CTO
After completing a PhD/Postdoc in materials/manufacturing engineering at the University of Cambridge, Andrew Lovatt entered technical consulting with Scientific Generics (now Sagentia). He joined Syrris in 2002 and now oversees all R&D activities including software, mechanical and electrical engineering and design.

Join an event

Join a workshop or demo the system
Syrris host an annual program of free chemistry workshops and training on a wide range of subjects, including flow chemistry. We have had fantastic feedback from previous delegates who work in a wide range of application areas. To register or enquire about upcoming chemistry workshops, complete our contact form or email workshop@syrris.com.