

China's first intelligent FLOW LAB manufacturer

make it flow

Holistic solutions for flow chemistry laboratory



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FLOW LAB



COMPANY INTRODUCTION

Ou Shi Sheng (Beijing) Technology Co., Ltd established in Jan 2015 . As a national high–technology enterprise, our aim is to provide holistic solutions for flow chemistry laboratory and manufacturer. The base of Ou Shi Sheng is located in Beijing, cooperating with Tsinghua University, Harbin Institute of Technology, Chinese Academy of Sciences and other labs in the area of flow chemistry applications by providing conventional or customized service.

The motto of our company is 'may the best craft bring us a better world'. We take customer demand as the driving force, pay deep attention to customer demand, continue to launch innovative products, and help customers' industrial upgrading with the best service.

Our vision is to embrace the latest technology and create the most practical products

may the best craft bring us a better world.

The pursuit of excellence the virtue of good cognition

Technology empowerment / Pursue excellence

Dedicated to giving / Dedicating the power of youth

CATALOGUE

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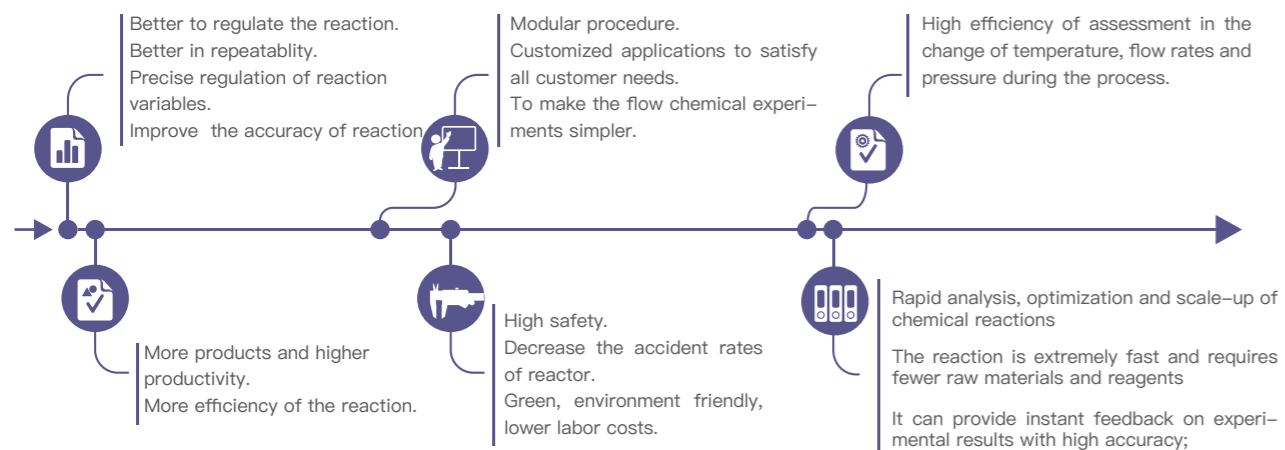
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Holistic Solution For Flow Chemistry Laboratory

Flow chemistry

In flow chemistry (A.K.A continuous flow chemistry), different types of reactants are delivered into reactor, pipes or micro-reactor by pumps at constant flow rates. The products can be collected at the outlet, or delivered to another flow chemical reactor for another reaction. The safety is greatly improved in this process, for only a small amount of materials retent in the device. At the same time, due to the inherent safety design of continuous flow technology, it can be used at reaction conditions that cannot be safely achieved in batch reactors. This enables more efficient process, higher product purity, and shorter residence time.

Advantages of flow chemistry



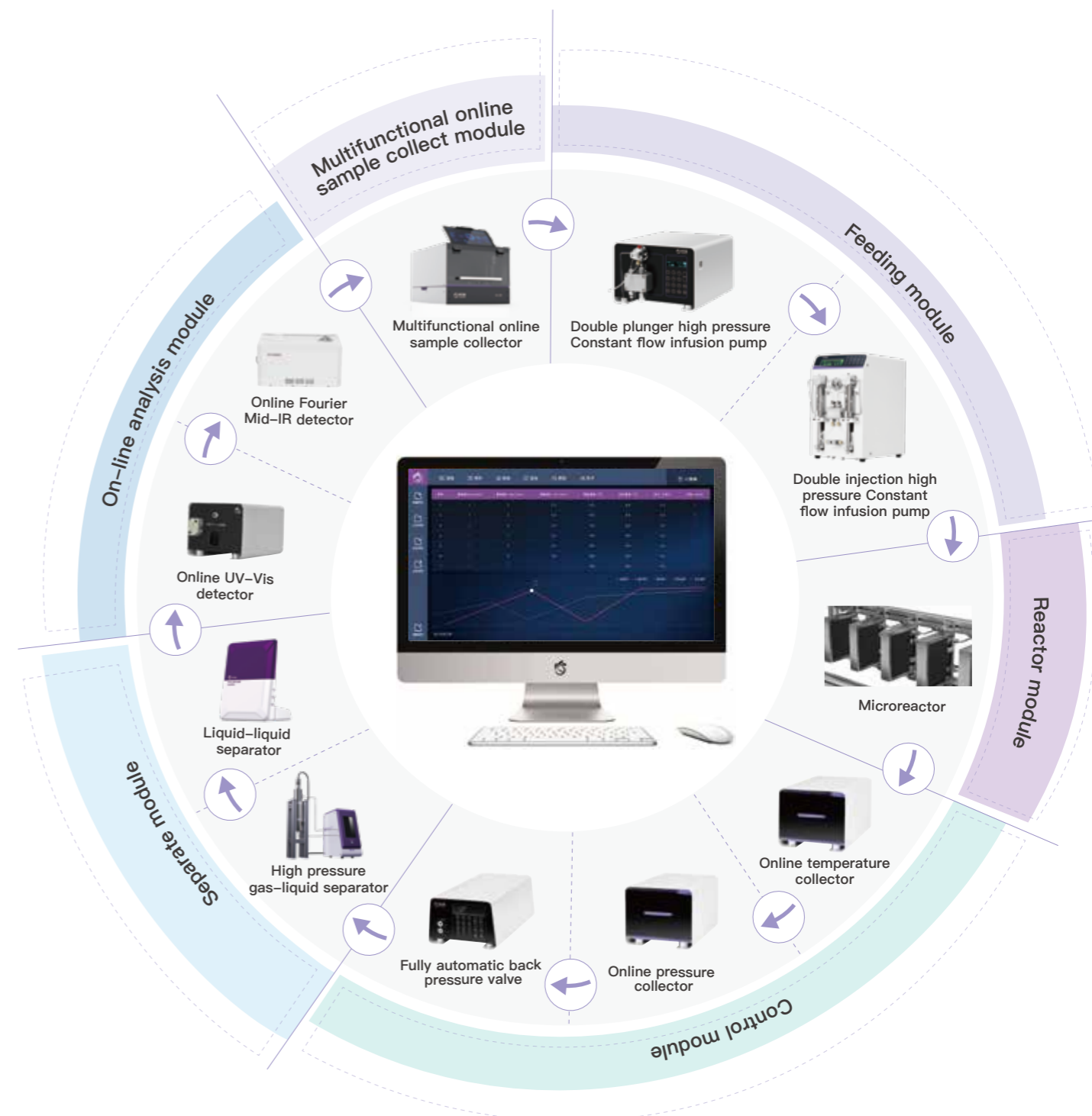
Recent years, a great number of flow chemical applications has been applied, especially in pharmaceuticals, fine chemicals, catalytic reactions, and polymer chemistry. Most developments in these chemical industries are too problematic for batch reactions and cannot be scaled-up.

A bunch of dangerous reactions are as follows:

- Hydrogenation
- Oxidation
- Halogenation
- Nitration
- Diazotization
- Grignard reaction
- Other reactions suitable for flow chemistry

Flow chemistry makes it safer to handle reactants that may endanger human health.

Modules for holistic chemical laboratory



Flowlab station



Feeding module

In flow chemistry, the feed module is the source of power for the entire flow system, and it is the key factor that determines whether the flow chemistry can be accurately completed. Feeding accuracy, stability, and reliability, as well as the diversity of types of fluids that can be delivered, are the key factors in evaluating the feeding system.

DP series dual plunger high pressure constant flow pump

Features:

Different pump materials, such as 316L, C276 and PTFE, to meet the needs for delivering different fluids.

- Flow range of 0.001 ~ 1600mL / min
- Two-dimensional flow velocity non-linear fitting technology to ensure flow accuracy in the entire flow range
- Open control platform, providing multiple communication interfaces such as RS485, RS232, 0-5V, etc.
- Can work in constant flow mode or constant pressure model, the two working modes can be switched arbitrarily.



Advanced assembly technology of cold pressing plunger rod

The plunger rod comes from Switzerland. Through the self-developed cold pressing plunger rod assembly process, the coaxiality is less than 0.01mm, which is the most advanced level.

Polyphase Cam Technology. Smaller size, but more stable flow rate.

Applied with newly invented polyphase cam technology, each cycle the cam rotate could accomplish several times of Reciprocating motion of plunger. Under electric motor low-speed rotation, the plunger could finish multiple times short stroke liquid supply. So the device could supply more stable flow with smaller devie size.

Multiple functional software monitor

The device could switch to constant mode or gradient mode.

Performance					
Model	DP-S10	DP-H10	DP-PT10	EXDP-S10 Split	EXDP-H10 Split
Flow rate	0.001-9.999mL/min				
Recommend flow rate	0.1-8mL/min				
Pump material	316L	C276	PTFE	316L	C276
Pressure limitation	35MPa (@1mL/min)	35MPa (@1mL/min)	4MPa (@1mL/min)	35MPa (@1mL/min)	
Work pressure	≤25MPa	≤25MPa	≤2MPa	≤25MPa	
Flow rate accuracy	±2%				
Flow rate repeatability	RSD≤0.5%				
Setting accuracy	0.02mL/min				
Inlet pipe	PFA OD 1/8" ID 1/16"				
Outlet pipe	316L OD 1/16", ID 0.03"	C276 OD 1/16", ID 0.03"	PFA OD 1/8", ID 0.03"	316L OD 1/16", ID 0.03"	C276 OD 1/16", ID 0.03"
Transmission interface	Male DB9 RS232 (Optional RS485, wifi)				
Size (mm)	280 D * 216 W * 155 H (pump is not included)			pump parts: 343.5 D * 150 W * 145 H control box: 400 D * 400 W * 210 H Explosion-proof grade: Exd IIB T4	

Model	DP-S50	DP-H50	DP-PT50	EXDP-S50 Split	EXDP-H50 Split	DP-S100	DP-H100	DP-PT100	EXDP-S100 Split	EXDP-H100 Split	
Flow rate	0.1-50mL/min					0.1-100mL/min					
Recommend flow rate	0.5-50mL/min					0.5-80mL/min					
Pump material	316L	C276	PTFE	316L	C276	316L	C276	PTFE	316L	C276	
Pressure limitation	25MPa (@1mL/min)	25MPa (@1mL/min)	4MPa (@1mL/min)	25MPa (@1mL/min)		25MPa (@1mL/min)	25MPa (@1mL/min)	4MPa (@1mL/min)	25MPa (@1mL/min)		
Work pressure	≤15MPa	≤15MPa	≤2MPa	≤15MPa		≤15MPa	≤15MPa	≤2MPa	≤8MPa		
Flow rate accuracy	±2%					±2%					
Flow rate repeatability	RSD≤0.5%					RSD≤1%					
Setting accuracy	0.1mL/min					0.1mL/min					
Inlet pipe	PFA OD 4mm ID 2mm					PFA OD 4mm ID 2mm					
Outlet pipe	316L OD 1/16", ID 0.03"	C276 OD 1/16", ID 0.03"	PFA OD 1/8", ID 0.03"	316L OD 1/16", ID 0.03"	C276 OD 1/16", ID 0.03"	316L OD 1/16", ID 0.03"	C276 OD 1/16", ID 0.03"	PFA OD 1/8", ID 0.08"	316L OD 1/16", ID 0.03"	C276 OD 1/16", ID 0.03"	
Transmission interface	Male DB9 RS232 (Optional RS485, wifi)										
Size (mm)	280 D * 216 W * 155 H (pump is not included)				Pump parts: 343.5 D * 150 W * 145 H Control box: 400 D * 400 W * 210 H Explosion-proof grade: Exd IIB T4		280 D * 216 W * 155 H (pump is not included)			Pump parts: 343.5 D * 150 W * 145 H Control box: 400 D * 400 W * 210 H Explosion-proof grade: Exd IIB T4	

Model	DP-S200	DP-H200	DP-PT200	EXDP-S200 Split	EXDP-H200 Split	DP-S500	DP-H500	EXDP-S500 Split	DP-S1000	DP-S1600	
Flow rate	0.1-200mL/min					1-500mL/min			1-1000 mL/min	1-1600 mL/min	
Recommend flow rate	1-160mL/min					3-400mL/min			5-800 mL/min	10-1300 mL/min	
Pump material	316L	C276	PTFE	316L	C276	316L	C276	316L	316L	316L	
Pressure limitation	15MPa (@1mL/min)		4MPa (@1mL/min)	15MPa (@1mL/min)		10MPa (@5mL/min)			2.5MPa (@10mL/min)	2.5MPa (@10mL/min)	
Work pressure	≤10MPa		≤2MPa	≤5MPa		≤5MPa			≤3MPa	≤1.5MPa	
Flow rate accuracy	±2%					±2%					
Flow rate repeatability	RSD≤1%					RSD≤1%					
Setting accuracy	0.1mL/min					1mL/min					
Inlet pipe	PFA OD 4mm ID2mm					PFA OD 6mm ID 4mm			PFA OD 1/4" ID 3/16"		
Outlet pipe	316L OD 1/16", ID 0.03"	C276 OD 1/16", ID 0.03"	PFA OD 1/8", ID 0.08"	316L OD 1/8", ID 0.08"	C276 OD 1/8", ID 0.08"	316L OD 1/8", ID 0.08"	C276 OD 1/8", ID 0.08"	316L OD 1/8", ID 0.08"	316L OD 1/8", ID 0.08"		
Transmission interface	Male DB9 RS232 (Optional RS485, wifi)										
Size (mm)	280 D * 216 W * 155 H (pump is not included)				Pump parts: 550 D * 250 W * 240 H Control box: 400 D * 400 W * 210 H Explosion-proof grade: Exd IIB T4		380 D * 297 W * 1193 H (pump is not included)			Pump parts: 550 D * 250 W * 240 H Control box: 400 D * 400 W * 210 H Explosion-proof grade: Exd IIB T4	



HP series dual syringe high-pressure constant flow pump

Features:

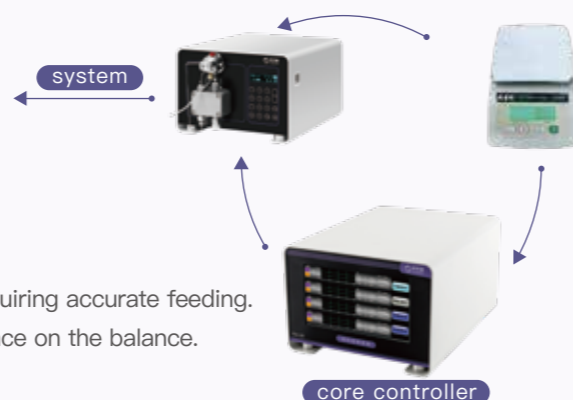
- The world's first large-flow, high-pressure, corrosion-resistant dual-syringe constant-flow pump
- Double syringe pumps run alternately, suitable for continuous delivery of conventional liquids, highly viscous liquids, and slurry containing nanoparticles
- Original active multi-phase cam switching valve, solves the problem that a single valve cannot meet high pressure requirement, high flux and corrosion resistance at the same time.
- Dynamic pressure compensation technology, through real-time monitoring of the system pressure to ensure the continuous pulseless liquid supply.
- High strength glass syringe is capable for different solvent.
- Available heating module with the heating temperature can reach 80°C, continuous high-temperature liquid transportation



Performance						
Model	HP-10	HP-H10	HP-30	HP-H30	HP-100	HP-H100
Driving mode	Dual syringe					
Flow rate	0.001-9.999mL/min		0.001-30.0mL/min		0.1-100.0mL/min	
Materials of pump	High strength glass					
Working pressure	≤6MPa					
Volumn of single injection	0.15μL			0.75μL		
Accuracy of flow rate	±1%					
Flow repeatability	RSD ≤ 0.3%					
Size (mm)	375 D * 254 W * 393 H			300 D * 230 W * 340 H		

Auto-feeding system

The auto-feeding system is consist of balance, core control unit and pump. The core control unit could control the pump flow rate by monitoring the change of the balance, to ensure the precisely supplement.



Features:

- On-line control 4 pumps at the same time.
- Support all types of pump.
- Fast react, the minimum regulate cycle is under 1 second.
- Support quantitative liquid supply, suitable for applications requiring accurate feeding.
- Automatic deduction of the impact of environmental interference on the balance.

Reaction module



Micro reactor

Performance					
Product name	Plate reactor	Reactants nozzle	Φ1/8"	Number of plates	5
Model	OSS-200A-4AZ	Cool medium nozzle	Φ1/4"	Heat transfer mode	Circulation bath
Materials	Silicon Carbide	Pressure limitation	≤4MPa	Temperature	-20-200°C
Recommend flow rates	≤200mL/min	Volume of each plate	7.0mL	Forbidden	Large particles
Product name	Plate reactor	Reactants nozzle	Φ1/8"	Number of plates	10
Model	OSS-210A-4AZ	Cool medium nozzle	Φ1/4"	Heat transfer mode	Circulation bath
Materials	Silicon Carbide	Pressure limitation	≤4MPa	Temperature	-20-200°C
Recommend flow rates	≤200mL/min	Volume of each plate	7.0mL	Forbidden	Large particles
Product name	Plate reactor	Reactants nozzle	Φ1/8"	Number of plates	5
Model	OSS-200A-4BT	Cool medium nozzle	Φ1/4"	Heat transfer mode	Circulation bath
Materials	Silicon Carbide	Pressure limitation	≤4MPa	Temperature	-20-200°C
Recommend flow rates	≤200mL/min	Volume of each plate	6 mL	Forbidden	Large particles
Product name	Plate reactor	Reactants nozzle	Φ1/8"	Number of plates	10
Model	OSS-210A-4BT	Cool medium nozzle	Φ1/4"	Heat transfer mode	Circulation bath
Materials	Silicon Carbide	Pressure limitation	≤4MPa	Temperature	-20-200°C
Recommend flow rates	≤200mL/min	Volume of each plate	6 mL	Forbidden	Large particles
Product name	HC Micro mixer	Flow reference	≤150mL/min	Heat transfer mode	Oil bath
Model	OSS-150A-8AZ-H	Pressure limitation	≤8MPa	Temperature	-20-200°C
Materials	Hastelloy	Liquid holding volume	0.186mL	Forbidden	Large particles
Product name	Micro mixer	Flow reference	≤150mL/min	Heat transfer mode	Oil bath
Model	OSS-150A-8AZ	Pressure limitation	≤8MPa	Temperature	-20-200°C
Materials	316L	Liquid holding volume	0.186mL	Forbidden	Large particles
Product name	Micro mixer	Flow reference	≤150mL/min	Heat transfer mode	Oil bath
Model	OSS-150A-8BJ	Pressure limitation	≤8MPa	Temperature	-20-200°C
Materials	316L	Liquid holding volume	0.173 mL	Forbidden	Large particles
Product name	HC Mixer	Flow reference	≤150mL/min	Heat transfer mode	Oil bath
Model	OSS-150A-8BJ-H	Pressure limitation	≤8MPa	Temperature	-20-200°C
Materials	Hastelloy	Liquid holding volume	0.173mL	Forbidden	Large particles
Product name	316L Tubular reactor	Materials	316L	Mixer liquid holding volume	0.173mL
Model	RST-116-2P30-BJ	Flow reference	≤150mL/min	Temperature	-20-200°C
Reactor liquid holding volume	31.4mL Contains an OSS-150A-8BJ mixer	Pressure limitation	≤8MPa		
Product name	316LTubular reactor	Materials	316L	Mixer liquid holding volume	0.186mL
Model	RST-116-2P30-AZ	Flow reference	≤150mL/min	Temperature	-20-200°C
Reactor liquid holding volume	31.4mL contains an OSS-150A-8AZ mixer	Pressure limitation	≤8MPa		
Product name	1/16 Tubular reactor	Materials	316L	Mixer liquid holding volume	0.173mL
Model	RST-116-2P5-BJ	Flow reference	≤50mL/min	Temperature	-20-200°C
Reactor liquid holding volume	5.17mL Contains an OSS-150A-8BJ mixer	Pressure limitation	≤8MPa		
Product name	1/16 Tubular reactor	Materials	316L	Mixer liquid holding volume	0.186mL
Model	RST-116-2P5-AZ	Flow reference	≤50mL/min	Temperature	-20-200°C
Reactor liquid holding volume	5.18mL Contains an OSS-150A-8AZ mixer	Pressure limitation	≤8MPa		
Product name	HC Tubular reactor	Materials	Hastelloy	Mixer liquid holding volume	0.173mL
Model	RST-116-2P30-BJH	Flow reference	≤150mL/min	Temperature	-20-200°C
Reactor liquid holding volume	31.4mL Contains an OSS-150A-8BJ-H mixer	Pressure limitation	≤8MPa		
Product name	HC Tubular reactor	Materials	Hastelloy	Mixer liquid holding volume	0.186mL
Model	RST-116-2P30-AZH	Flow reference	≤150mL/min	Temperature	-20-200°C
Reactor liquid holding volume	31.4mL Contains an OSS-150A-8AZ-H mixer	Pressure limitation	≤8MPa		



Reaction control module

In the continuous reaction process, the monitoring of temperature and pressure parameters can provide real data for the reaction, and at the same time provide reaction analysis. In the process of continuous fluidization reaction, the monitoring of temperature and pressure parameters can provide real data for the reaction, and provide data support for reaction analysis; rapid temperature and pressure acquisition and control with accurate sensor devices is critical to the success of flow chemistry process development one of the key factors.

On-line temperature detector

Character:

- Using contacting pipe temperature sensor, the detector can monitor real-time temperature without lag-time.
- The detector can monitor 4-lines temperature at the same time.
- 316L material, capable for gas and conventional liquid



Performance			
Model	CT-100	Compatible temperature sensor	PT100
Regulation range	0°C-200°C	Mode setting	PCSoftware management system, man-machine interface Linux system
Temperature control channel	4 way (standard) Optional to 10 channels	Transmission interface	RS232 (standard)、RS485、wifi (customizable)
Temperature resolution	0.1°C		

BP series on-line automate back-pressure valve

Character:

- Fast response in 3 seconds, automate regulate pressure.
- Different types of pump material, capable for different types of gas or liquid.
- Customized 200°C high-temperature back-pressure valve, capable for high-temperature reaction.
- High sensitive digital pressure sensor, precisely regulate the pressure.



Performance						
Model	BP-A250	BP-A500	BP-A1500	BP-H1500	BP-A3000	BP-H3000
Pressure range	0.1-250psi	0.2-500psi	0.2-1500psi	0.2-1500psi	0.2-3000psi	
Valve materials	316L stainless steel, C276 hastelloy					
Regulate precision	±1%					
Repeatability	0.5%					
Response time	≤3s					
Leakage rate	2×10 ⁻⁸ atm.cc/sec He					
Temperature	-40-70°C, 200°C (customized)					

Multi-channel gas flow controller

Character:

- Multi-channel gas flow controller can monitor 8 gas-channels at the same time.
- Multi-channel gas flow controller can monitor real-time gas flow change precisely by setting accurate gas flow rate.



Performance			
Model	GC-100	Pressure drop	<0.02MPa.
Flow rates	(0-5, 10, 20, 30, 50, 100, 200, 300, 500, 1000) SCCM (0-1,2,3,5,10,20,30) SLM	Channels	Route 8
		Pressure	10MPa
Precision	±0.5% F.S. (20,30SLM: ±2% F.S.)	Mode setting	PC software management system, man-machine interface Linux system
Repeatability	±0.2% F.S	Transmission interface	RS232 (standard), RS485,wifi (customizable)

On-line pressure detector

Character:

- 4 channels detection at the same time.
- No waste volume for the sensor is directly attached to the pipe.
- The material is stainless steel, which is capable for gas and conventional liquid.
- Different sensor is capable for customized requirement.



Performance			
Model	PC-100	Channel	4-way (standard) optional to 10-way
Pressure sensor	2.5MPa, 10MPa, 20MPa, 40MPa, 60MPa	Control method	PC software management system, man-machine interface Linux system
Communication Interface	RS232 (standard), RS485, wifi (customizable)	Pressure precision	0.1MPa

Multi-channel valve controller

Character:

The controller can control 4 magnetic valves at the same time. By orders from PC software, the magnetic valves can be controlled easily and precisely.



Performance	
Model	VC-100
Valves	4
Charge	DC12V/24V、AC220V
Control mode	PC software management system, man-machine interface Linux system
Transmission interface	RS232 (standard), RS485 wifi (customizable)



Separation module

High-pressure gas-liquid separator

The device adopts the design structure that the separation column tube and the automatic control system are separated, and the installation position of the equipment can be freely changed in different experimental places, which is flexible and convenient.

It is widely used in the continuous separation of gas-liquid mixtures, improving the automation of equipment, ensuring the stability of the pressure flow of the reaction system and the operation effect of the process system

Character:

- Build-in high sensitive water-level sensor, detect water-level precisely, precision $\pm 0.5\text{mm}$.
- Optional 316 stainless steel or C276 Hastelloy, capable for high corrosion gas-liquid separation.
- Combination of automate high pressure liquid back-pressure valve and high pressure liquid steady flow valve, the separator can work under high pressure.
- Optimal liquid products collector, for maximum 8 product samples from different time.



Performance

Model	GLS-FLOW	Detection of liquid-level	0~100%	Resolution of liquid-level	$\pm 0.5\text{mm}$
Pressure	$\leq 1000\text{psi}$	Settable liquid-level	20~80%	Volume of separator	100 mL, 300mL, 500 mL
Flow rate	1~30mL/min, 5~80mL/min, 10~120mL/min			Materials	316 stainless steel (or C276), PTFE, FFKM
Size (mm)	270 D * 180 W * 360 H			Pipe nozzle	OD 1/8", ID 1/16

S-Flow-S30 liquid-liquid phase separator

The device adopts a membrane module structure and utilizes the difference in liquid surface tension to provide continuous online separation of immiscible fluids. Both liquid and liquid systems can be quickly realized separation, while meeting the requirements of continuous flow chemical production, is a separation equipment with significant advantages in economy, convenience and safety.

Character:

- The extractor could on-line extract continuous flow.
- The separation process is completely closed and leak-free, suitable for handling explosive or highly toxic liquids.
- Wetted liquid is 316 stainless steel, perfluoropolymer with excellent chemical resistance.
- Efficient separation reduces extraction solvent consumption.
- Intelligent design, simple operation, only need to flow the mixed fluid from the inlet, the water phase and the organic phase flow out from the outlet respectively



Performance

Model	S-FLOW-S30	Work pressure	<50psi	Flowrate range	0~30mL/min
Material in contact with liquid	316 Stainless Steel, Perfluoropolymer Tubing Specifications			Size (mm)	180 D * 170 W * 245 H

On-line detection module

When the on-line detection module is combined with process analysis technology, flow chemistry can achieve rapid analysis, optimization and scale-up production of chemical reaction. Researchers can monitor steady-state conditions, eliminate faults in the process and identify reactive intermediates through continuous real-time analysis. At the same time, through the test results, the feeding speed, reaction system temperature and pressure can be optimized in real time to realize the closed-loop control of the fluidization process.

Online UV-Vis Detector

Character:

- Capable for on-line continuous monitor in reduction and other color reaction.
- Using low-watts pulsed xenon lamp, life-time can be as long as 5 years, over 1 billion times pulse.
- With on-line controlling software and build-in chemometric methods, the device can calculate the real-time concentration.
- Distinguish overlapping peak by mathematic methods, providing a higher-resolution of products.
- Applying transmission interface for other device.



Pulse Xenon Lamp



External fiber probe



Flow cell

Performance

Model	UV-Vis-950
Wavelength range	200~950nm
Wavelength accuracy	$\pm 1\text{nm}$
Wavelength bandwidth	8nm/4nm
Optical path of circulation pool	5nm/10nm
Volume of circulation pool	70 μL /35 μL
Optical path of sensor	0.5~20mm
Materials of sensor	316 stainless steel, Hastelloy, PEEK
Transmission interface	USB
Size (mm)	208 D * 136 W * 120 H



On-line Fourier transformed infrared detector

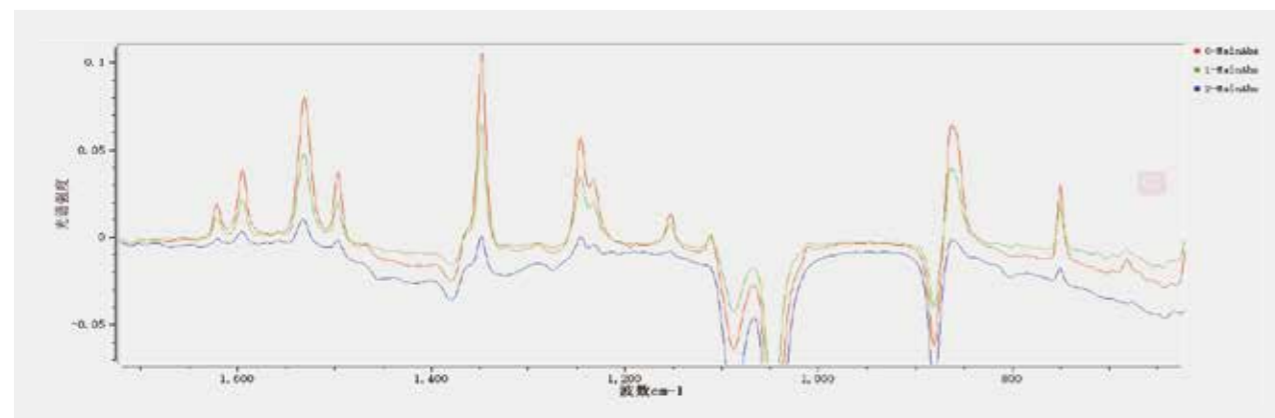
On-line Fourier transformed infrared detector is a fast, accurate and widely-used device for detection. Infrared ray can interact with chemicals, inducing rotation and vibration of different molecular bonds. According to infrared spectrum, identification and analyzation can be done to unknown chemicals. Equipped with an integrated ATR circulation collection system, it can detect the composition of the tested sample in real time, which is suitable for on-line detection of the process.

Character:

- DiamondATR optical material is capable for different industrial environments.
- Golden reflection optical system is stable to oxidation, providing more stable optical data.
- Customizable high sensitivity room temperature detector or electric refrigeration MCT detector is suitable for the detection of trace compounds.



The characteristic absorption spectrum of p-nitrochlorobenzene



Performance			
Model	FT-IR500	Spectral range	5000-500cm ⁻¹
Highest temperature	Diamond(200°C)	Purge	Not required
Beam splitter	Humid resistance ZnSe	Transmission interface	LAN
Resolution	Better than 2cm ⁻¹	Detector	TE-MCT
ATR Optical diamond	Diamond	Software	Continuous measurement and real-time display of reactor trend chart
ATR Optimal pH	Diamond(1-14)	Detection mode	Continuous on-line monitoring mode and off-line measurement mode
Size (mm)	381 D * 274 W * 200 H		

Collect module

Multi-functional sample collect system could sampling in different times as settled, and record the sampling time precisely. A better plan for flow chemistry can be done under this system's help.

Multi-function on-line sample collector

Character:

- 100 sample bottles, capable for gas, liquid and mass-spectrum sample.
- Full quantitative ring six way valve for precisely sampling.
- Available automate dilute.



Performance	
Model	AS-100
Volume of sampling	2x50 Sample plates (2mL Sample bottle)
Sample ring volume	100µL(Can be customized if in needs)
Syringe volume	5mL
Minimum gap time for sampling	3min
Collect mode	Full quantitative ring
Residual sample	<0.1%
Transmission interface	RS232 (standard), RS485, WiFi (optional)
Size (mm)	510 D * 353 W * 305 H



TH series high-pressure hydrogen generator

TH series high-pressure hydrogen generator is a compact device. With modified proton exchange membrane high pressure electrolysis technology, the generator electrolysis water directly and get pure high pressure hydrogen after steps of purification, booster pump is not required. Operation system and multiple high sensitive sensors for pressure, temperature and hydrogen, are pre-built-in, to make the device easy-used, friendly and safe.

Character:

- Hydrogen product with use, for it comes from electrolysis.
- Providing 99.999% hydrogen flow with maximum 7 MPa pressure, this generator can replace high-pressure hydrogen cylinders in labs.
- Triple pressure-insurance to make sure the generator is safe.
- Settable pressure limitation for longer life-time of electrolytic cell.
- Visualized water level.
- Remind the service life of desiccant, to avoid water vapor flowing into the subsequent system.
- Untouchable high-sensitive water level sensor, avoiding low-level water harm the electrolytic cell.
- Build-in high-sensitive hydrogen sensor, beeping when hydrogen leak.



Performance			
Model	TH-7300H	TH-7500H	TH-100K
Hydrogen purity	99.999%		
Hydrogen flow rate	0-320mL/min	0-500mL/min	0-1000mL/min
Output pressure	0-7MPa	0-7MPa	0-7MPa
Water volume	0.5-1.6L		
Water demand	ddH ₂ O, Conductivity≤0.2μS/cm		
Charge required	220V±10% 50Hz		
Watts	160W	280W	550W
Environment requirement	5-40°C <80%RH		
Recommend environment	Fume hood		
Output interface	316 stainless steel OD1/8"		
Net weight	Approximately 15kg		
Size (mm)	420 D * 260 W * 440 H		520 D * 300 W * 520 H

Flow Chemistry Management System

Flow Chemistry Management System is using modularization mode. Custom could build flow chemical module unit freely, depends on each module function and work state such as flow rate, pressure, temperature, detector and collector. Meanwhile, this system can be the best friend to researchers, for the huge amounts of experimental data managing plan, experimental development managing plan, remote monitoring plan for the craft development recording, tracing and analyzing.



Whole process control to the reaction system

Whole process control can maximum the advantage of each module. By feeding module, temperature module, pressure module, on-line detect module and collect module freely setting, the system can program each step of the flow chemical process, helping in optimizing the best route.

The huge amounts of experimental data managing plan

Provide data basis for researchers to develop the best process route, by storing, classifying and analyzing large amounts of experimental data.

Experimental development managing plan

Managing experimental trials, including variable setting and modifying, tracing process data and other records, to benefit the development of whole process

Remote monitoring plan

Managing experimental trials, including variable setting and modifying, tracing process data and other records, to benefit the development of whole process



NO.2

Microreaction Continuous Hydrogenation Solutions

H-Flow

FULLY AUTOMATIC HYDROGENATION REACTOR

H-Flow is a fully automatic hydrogenation reactor based on the continuous flow technology. The instrument is applying the microreactor technology derived from Tsinghua University, which achieves the rapid mixing of high-purity hydrogen and reactants to realize a continuous hydrogenation in a micro-packed bed filled with catalysts. Combining with the fully automatic control strategy, in-line analysis module and automatic sample collection function, H-flow can realize a safer and more efficient process for the hydrogenation reaction.

H-flow is suitable for the rapid process optimization and catalyst screening. For some kilogram-scale production requirements, a high-throughput model can also be provided for the continuous hydrogenation in fume hoods.



Parameters				
Model	H-Flow-S10	H-Flow-H10	H-Flow-S50	H-Flow-H50
Material	316L	C276	316L	C276
Volume of catalyst in reactor	5.6mL		150.7mL	
Catalyst particles	0.2-2mm			
Pressure	<10Mpa			
Temperature	RT≤200°C			
Pre-heating	RT ~200°C			
Liquid feed flow rate	0.02-9.999 mL/min		0.1-50.0 mL/min	
Liquid feed accuracy	±2%FS			
Hydrogen feed flow rate	5-100sccm		100-1000sccm	
Nitrogen feed flow rate	5-100sccm		100-1000sccm	
Size (mm)	550 D * 430 W * 625 H		600 D * 484 W * 725 H	

Remarks:

All models have optimal full-process heating accessory to achieve full-process temperature management. H-Flow-50 series require accessory oil bath system. There are nozzles for oil bath system.

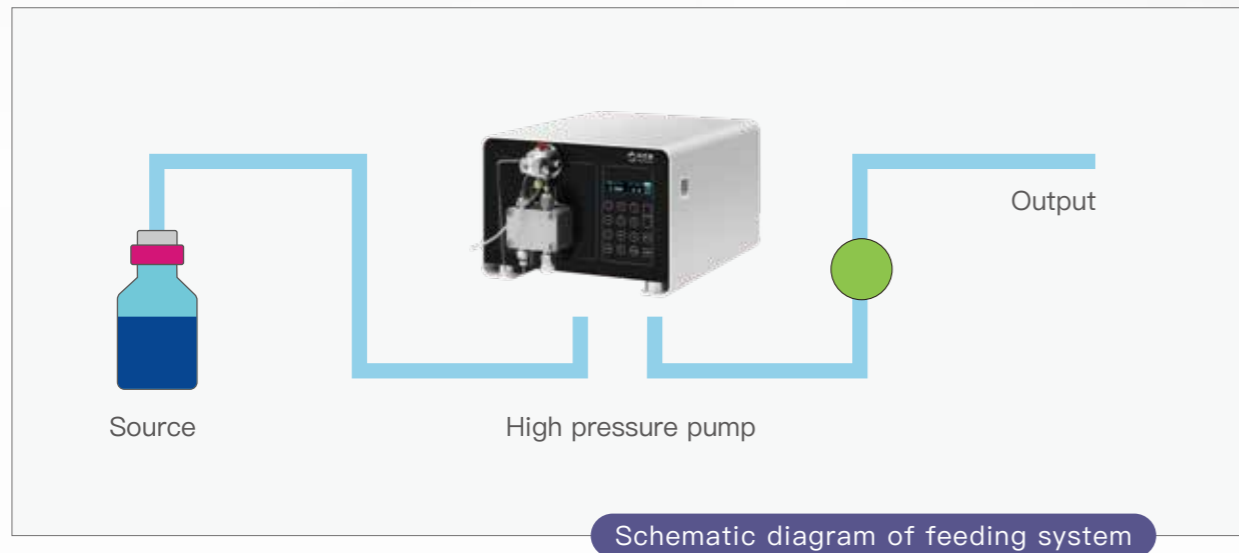
Character:

- H-Flow can link to hydrogen cylinder directly or High pressure hydrogen generator.
- The whole process is under control, little difference between different batch.
- Minimum the hydrogenation time, lower than 3 minutes.
- Small size of reactor leading to high safety.
- Preserved sampling port, to monitor the reaction in milligram scale at real-time.
- Maximum 200°C and 10MPa pressure, is capable to most hydrogenations.
- High-throughput model produce product in kilogram scale.
- Small size of the device is capable in fume hood.
- Optimal on-line UV-Vis detector and Fourier transformed infrared detector can help in real-time monitoring and analyzing.
- Optimal on-line sample collector, sampling at setting times automatically.



Feeding system

Feeding system can transport liquids into microreactor steady and precisely. 316L and C276 pump materials are capable for different liquids. The flow pressure is under high-sensitivie regulation, to avoid over-pressure of the whole system.

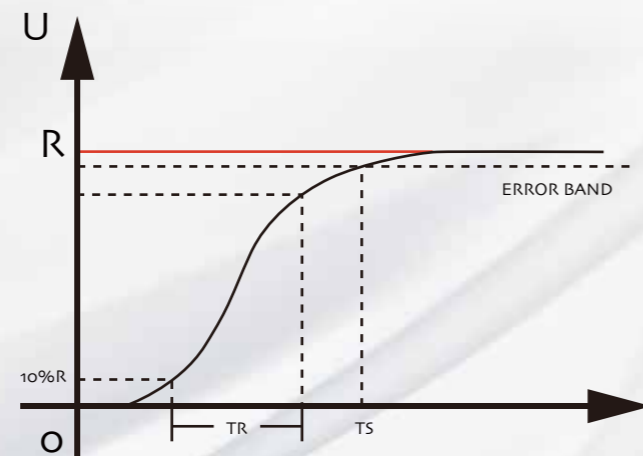


Gas Supply Unit

Upstream is supplying hydrogen from cylinder or hydrogen generator. By the gas regulation system on the device, H-Flow can regulate the hydrogenation precisely.

Temperature Control Unit

Using PID multi-channel temperature control system, the liquid flow temperature is regulated during the whole process. From the entrance to the exit, the whole process is divided into 4 parts. With optional heating-accessory, the hydrogenation is under precisely regulation.



PID temperature control curve

Micro Reactor Unit

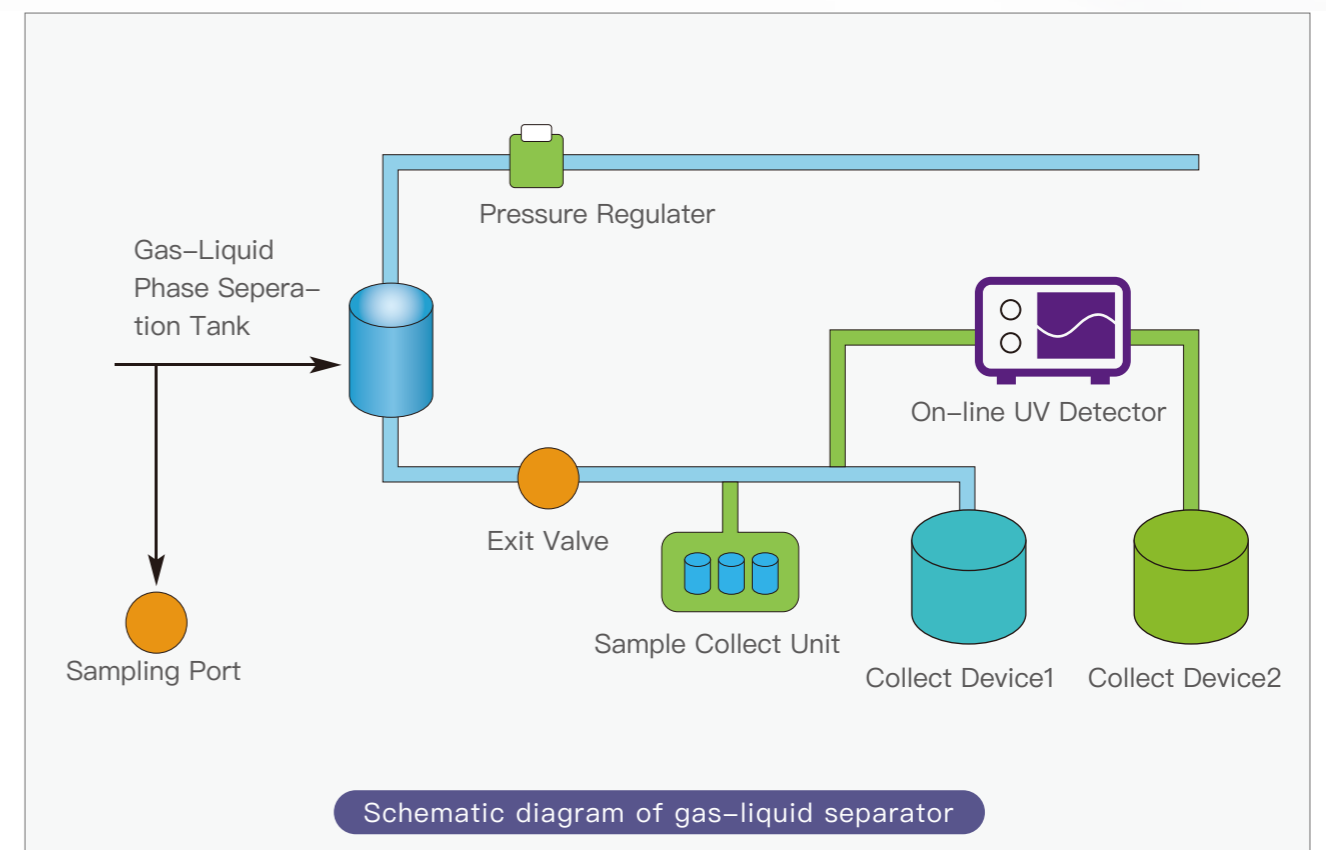
Liquid source and hydrogen are mixed through micro-channel mixer. Then they are catalysed with the presence of catalyst under certain temperature and pressure. Standard detachable port is designed for fast catalyst reload.

Pressure Control Unit

Providing maximal 10MPa pressure precisely regulation, for higher efficiency.

Gas-Liquid Seperate Unit

High sensitive liquid-level sensor, as precise as $\pm 0.1\text{mL}$. When liquid products accumulate, exit valve open to release liquid products automatically.





Hydrogen Source Unit

Character:

- Hydrogen product with use, for it comes from electrolysis.
- Providing 99.999% hydrogen flow with maximum 7 MPa pressure, this generator can replace high-pressure hydrogen cylinders in labs.
- Triple pressure-insurance to make sure the generator is safe.
- Settable pressure limitation for longer life-time of electrolytic cell.
- Visualized liquid level.
- Remind the service life of desiccant, to avoid water vapor flowing into the subsequent system.
- Untouchable high-sensitive liquid level sensor, avoiding low-level water harm the electrolytic cell.
- Build-in high-sensitive hydrogen sensor, beeping when hydrogen leak.



High pressure hydrogen generator

Sampling Unit

Multi-functional sample collect system could sample at different times as settled, and record the sampling time precisely. A better plan for flow chemistry can be done under this system's help.

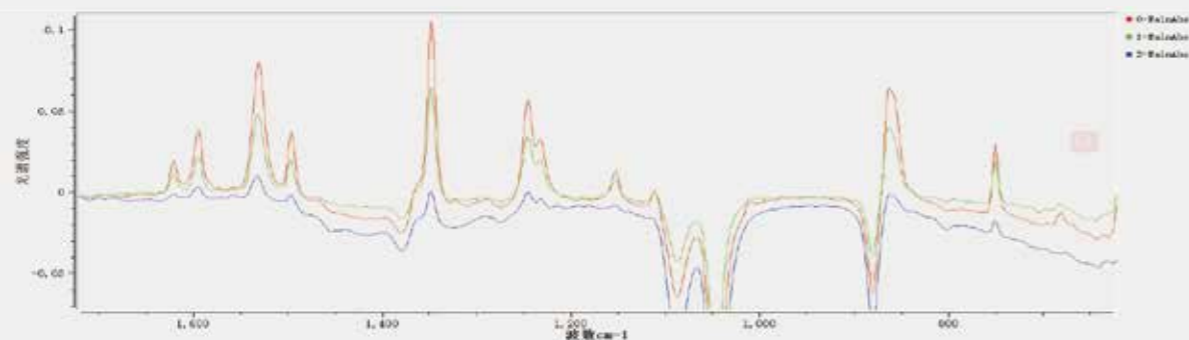


Preserved sampling port, for fast sampling

- 100 sample bottles, capatible for gas, liquid and mass-spec-trum sample.
- Full quantitative ring six way valve for precisely sampling.
- Available automate dilute.

On-line Detect Unit

- In-line ultraviolet and in-line Fourier mid-infrared detectors can be selected according to the characteristics of hydrogenation reactants.
- The online detection module is combined with the hydrogenation process technology to realize the online analysis of hydrogenation products. The boundary reaction conditions can be set according to the detection results to improve the reaction efficiency To achieve the closed-loop control of the hydrogenation process and provide more data for the development of hydrogenation methods.



H-Flow Manage Software

H-Flow manage software help hydrogenation reactor work at the BEST conditions, making whole hydrogenation automately.

- The method management mode effectively manages the entire hydrogenation process according to the work-flow, and formulates the most.
- Excellent hydrogenation process route.
- Matrix method execution scheme to improve catalyst screening and hydrogenation method development efficiency.
- Visualize the operation mode to make the system workflow clear at a glance.
- When necessary, users are allowed to monitor the device remotely through the local area network.
- Record the experimental track of the entire process, including parameter setting, modification, and process data traceability
- The whole process of experimental development is recorded and managed to provide powerful help to the developers of the process.
- Taking the process method as a unit, a large amount of experimental basic data is stored, and the basic data is normalized.
- Class analysis provides a data basis for hydrogenation process developers to develop the best process route.



Catalyst

Name	Specification	Cas No.
Pd/C	5%~10%	OSS1901-1010
Pd/Al ₂ O ₃	3%~10%	OSS1901-1030
Pd(OH) ₂ /C	5%~20%	OSS1901-1120
Pd(OH) ₂ /Al ₂ O ₃	3%~10%	OSS1901-1130
Pt/C	1%~5%	OSS1901-9010
Pt/Al ₂ O ₃	1%~5%	OSS1901-9020
Ru/Al ₂ O ₃	1%~5%	OSS1901-3030
Rh/Al ₂ O ₃	1%~5%	OSS1901-3040
Ni/SiO ₂ Nitro reduction	20%	OSS1901-3050NO
Ni/SiO ₂ Cyano reduction	20%	OSS1901-3050CN
Ru/C	5%	OSS1901-3010
Rh/C	3%~5%	OSS1901-4010

Applications

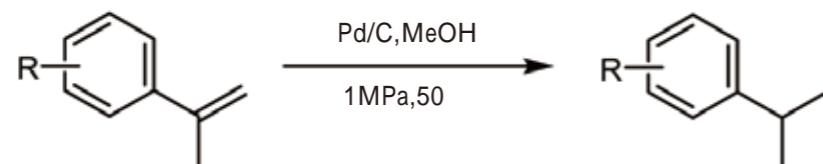
- N-, O-Debenzylation
- Reduction of nitrile compounds
- Reduction of olefins and alkynes
- Nitro-reduction
- Dehalogenation
- Reduction of pyridine aromatic ring derivatives
- Hydrodesulfurization
- Imine reduction
- Carbonylation
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Examples

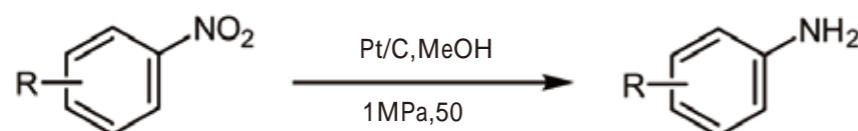
Unsaturated olefin Hydrogenation reduction

Solution	15% methyl styrene derivative in methanol	Hydrogen flow rate	60sccm
Catalyst	3g of 2%Pd/C	Reaction temperature	50°C
Acquisition rate	By gas chromatography analysis, the yield of product cumene is 99.6%	Pressure	1MPa
Pump Flow Rate	1mL/min		



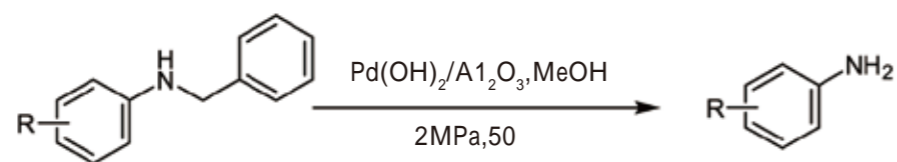
Nitro hydrogenation reductio

Solution	10% nitrobenzene derivatives in methanol	Hydrogen flow rate	60sccm
Catalyst	5g of 5%Pt/C	Reaction temperature	50°C
Acquisition rate	By gas chromatography, the yield of the product aniline is 99.6%	Pressure	1MPa
Pump Flow Rate	1mL/min		



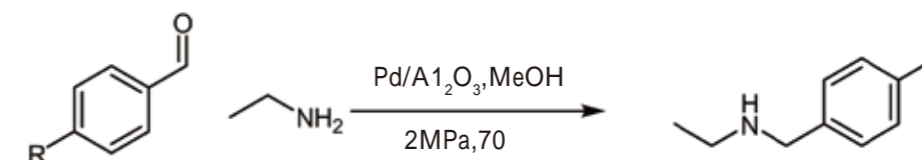
Hydrodebenzylation

Solution	15% N-benzyl substrate derivative in methanol	Hydrogen flow rate	60sccm
Catalyst	5g of 7% Pd(OH) ₂ /Al ₂ O ₃	Reaction temperature	50°C
Acquisition rate	By gas chromatography analysis, the conversion of the product was 99.8%	Pressure	2MPa
Pump Flow Rate	0.4mL/min		



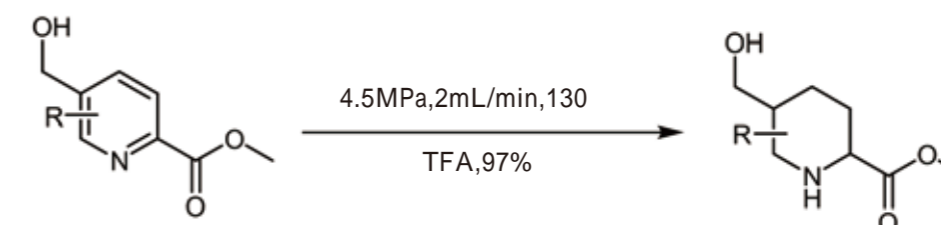
Reductive amination

Solution	10% Benzaldehyde derivatives in methanol	Hydrogen flow rate	60sccm
Catalyst	5g of 5%Pd/Al ₂ O ₃	Reaction temperature	70°C
Acquisition rate	By gas chromatography, the yield of the product was 99.8%	Pressure	2MPa
Pump Flow Rate	0.6mL/min		

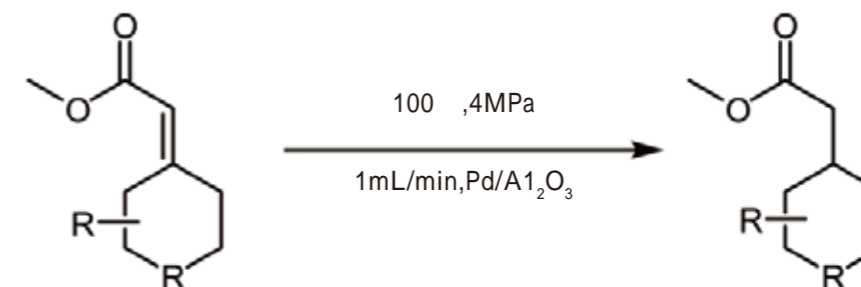


Hydrogenation and reduction of pyridine derivatives

Solution	2% pyridine derivatives in methanol	Hydrogen flow rate	40sccm
Catalyst	5g of 5% Pd/Al ₂ O ₃	Reaction temperature	130°C
Acquisition rate	By gas chromatography analysis, the conversion of the product was 97%	Pressure	4.5 MPa
Pump Flow Rate	2mL/min		

 α , β Reduction reaction of unsaturated keto acid derivatives

Solution	4% α , β Unsaturated keto acid derivatives in methanol	Hydrogen flow rate	40sccm
Catalyst	5g of 5%Pd/Al ₂ O ₃	Reaction temperature	100°C
Acquisition rate	By gas chromatography analysis, the conversion of the product was 97.6%	Pressure	4MPa
Pump Flow Rate	1mL/min		





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Other Parts

High pressure syringe

316L series and C276 series syringe, combined with standard syringe pump to fulfill liquid transportation.



Performance

Model	Material	Volume (mL)	Inner diameter (mm)	Flow rate (μl/min-ml/min)
HPS-20	316L	20	19.13	1.4371-37.3648
HPS-50	316L	50	28.6	3.2121-83.5152
HPS-100	316L	100	34.9	4.7831-124.361
HPH-20	C276	20	19.13	1.4371-37.3648
HPH-50	C276	50	28.6	3.2121-83.5152
HPH-100	C276	100	34.9	4.7831-124.361

Differential pressure gas mass flow controller

Mass flow controller (MFC) is used for precisely gas flow measurements and regulation. It's widely used in many detectors and analyzers. Good MFC can help in accuracy and reliability of measurements and analysing.



Performance

Model	MFC-300	MFC-600
Full scale flow specification	3SLPM	6SLPM
Flow rate control range	5%~100% F.S.	
Flow rate measurement range	0%~100% F.S.	
Accuracy	±1%	
Repeatability	≤0.5%	
Response time	<100ms	
Work pressure	0.05Mpa~0.2Mpa	
Leak rate	1x10 ⁻⁹ atm•cc/sec He	
Seal material	Fluororubber Teflon	
Working voltage and current	15VDC/500mA	
Watts	<5W	
Transmission interface	RS232 DB9 pin (Male)	
input / output	0-5.00V DC	



Part of the shared laboratory platform

- ① Shenyang Pharmaceutical University Joint Laboratory
- ② Tsinghua University Technology Development Platform
- ③ Hangzhou Oushisheng Flow Chemistry Experiment Platform
- ④ Guangzhou Analysis and Testing Center Flow Chemistry Experience Platform
- ⑤ Nanjing Oushisheng Flow Chemistry Experience Platform
- ⑥ Wuhan Oushisheng Flow Chemistry Experience Platform
- ⑦ Flow Chemistry Experience Platform of West China University of Pharmacy
- ⑧ Fuzhou University Flow Chemistry and Fine Chemical Joint Application Center
- ⑨ Shandong is under construction
- ⑩ Chongqing area is under construction

Flow Chemistry Joint Laboratory



Shenyang Pharmaceutical University



Fuzhou University