BEL
MicrotracBEL Corp.

Micro-reactor system for catalytic reaction research

BEL-REA

Specialists in Adsorption

Customizable according to user's requirements

BEL-REA

Overview

In the catalyst research field, of course, the performance of catalyst is important.
Also, the research of reaction conditions is very important.
BEL-REA is a compact fixed-bed flow reactor. The reaction can be observed for a variety conditions.
According to user' s requirement, this system can be customized.

For further information, please let us know your application in detail, such as reaction gas flow, reaction temperature, pressure, etc...

Case1

Application: Steam reforming of DME

Dimethyl ether (DME) is expected as a clean fuel of the next generation. Especially, in the fuel cell research field, DME has attracted attention as a potential fuel for hydrogen production. Hydrogen can be produced by the following steam reforming reaction.

$$(CH_3)_2O + 3H_2O \rightarrow 6H_2 + 2CO_2$$

This system is mainly used for the steam reforming reaction research of dimethyl ether.

Features

- Stripped down system, inexpensive.
- Small foot-print. Desktop type instrument.
- Large amount of liquid can be dosed using HPLC pump.
- This simple micro-reactor can be used for other various applications.

Specifications

Gas and vapor supplier	No. of gas lines	3
	Gas flow control	Mass flow controller (3 units)
	Gas flow rate (Negotiable)	REACTION GAS 1: 500 sccm REACTION GAS 2: 30 sccm REACTION GAS 3: 2 sccm
	Vapor generator	HPLC pump + Evapolator (Max. 180°C) × 1 line
Reactor	No. of reactors	1
	Temp. range	100 ~ 800°C
	Pressure range	ATM (O.P. : Automatic pressure controller < 1.0MPa)
Gas-liquid separator	Temp.	20°C (Water-cooled system)
	Reservoir volume	100ml (Collectable liquid volume : Max. 90ml)
Gas analysis		microGC
Dimensions		800(W) × 850(H) × 550(D)mm

Case2

Application: Fischer-Tropsch reaction (GTL)

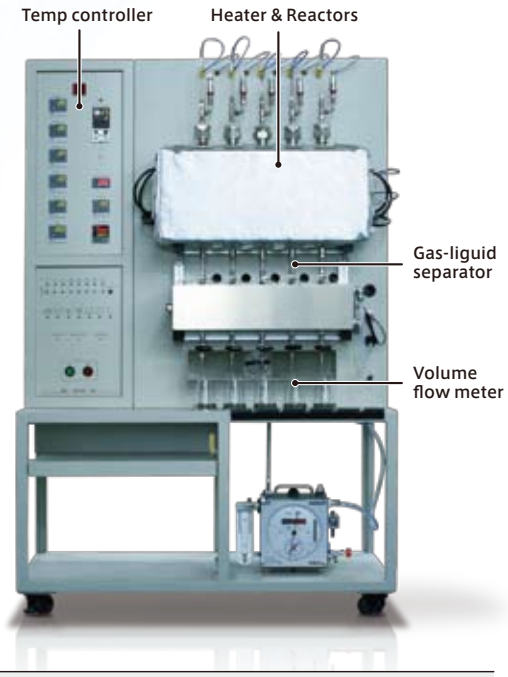
This BEL-REA system is for Fischer-Tropsh reaction system to study gas to liquid process. The Fischer-Tropsch process is a catalysed chemical reaction in which carbon monoxide and hydrogen are converted into liquid hydrocarbons of various forms.

$$(2n + 1)\ H_2 + n\ CO \rightarrow C_nH_{2n+2} + n\ H_2O$$

Typical catalysts used are based on iron and cobalt.
The principal purpose of this process is to produce a synthetic petroleum substitute, typically from coal or natural gas, for use as synthetic lubrication oil or as synthetic fuel
The Fischer-Tropsch reaction is one of the most important processes in C1 chemistry.

Features

- Under the various reaction conditions (the composition and the flow rate of reaction gas, the reaction temperature and pressure, etc.), Fischer-Tropsh reaction can be observed.
- High-throughput system with 5ch sample vessels.
- Quantitative and qualitative analysis of reaction product using a gas chromatography and a volume flow meter.
- Automatic measurement. The measurement conditions can be set easily on the user-friendly software.



Specifications

Gas supplier	No. of gas lines	3 (N_2, CO, H_2)
	Gas flow control	Mass flow controller (3units)
	Gas flow rate (Negotiable)	N_2 : 0.7 ~ 1.5 slm CO : 0.025 ~ 0.5 slm H_2 : 0.05 ~ 1.0 slm
Reactor	No. of reactors	5
	Volume of reactors	1ml or 5ml
	Temp. range	100 ~ 400℃
	Pressure range	1.0 ~ 3.0MPa (Automatic pressure controller)
Gas-liquid separator	Temp.	150 ~ 200℃ (Heater system) 10 ~ 20℃ (Water-cooled system)
	Reservoir volume	75ml (Collectable liquid volume: Max. 35ml)
Gas analysis		microGC, Volume flow meter
Dimensions		1000(W) × 1500(H) × 650(D)mm

Case3

Application: Water gas shift reaction

The water gas shift reaction is an inorganic chemical reaction in which water and carbon monoxide react to form carbon dioxide and hydrogen (water splitting).
It is part of steam reforming of hydrocarbons and is involved in the chemistry of catalytic converters.
It was discovered by Italian physicist Felice Fontana in 1780.

$$CO + H_2O \rightarrow CO_2 + H_2$$

While this reaction could be used to produce hydrogen, the high temperatures required make it cost-prohibitive.
The generation of hydrogen, itself has significant promise as a replacement clean burning fuel itself however this reaction is usually done via the byproducts of fossil fuel combustion.
The carbon monoxide can also be generated by bogs or other waste regenerative means.
Attempts to lower the reaction temperature of this reaction have been done primarily with a catalyst such as Fe_3O_4ss (magnetite), CuO, or other transition metals and transition metal oxides.

Features

- Five samples can be set at once.
- Automatic control.
- The lines in which water vapor go through is placed in the air oven to prevent condensation.
- Accurate liquid volume control using a syringe pump.

Specifications

Gas and vapor supplier	No. of gas lines	4 (3: reaction gas mixer, 1: purge gas)
	Gas flow control	Mass flow controller (4 units)
	Gas flow rate (Negotiable)	REACTION GAS1: 100 sccm REACTION GAS2: 10 sccm REACTION GAS3: 100 sccm REACTION GAS4: 500 sccm
	Vapor generator	Syringe pump + Evaporator (Max. 180°C) × 1 line
Reactor	No. of reactors	5 (During one sample is being tested, other 4 samples are purged)
	Temp. range	50 ~ 500°C (OPT: 900°C)
Air oven	Temp.	Max. 100°C
Gas analysis		microGC or Mass spectrometer
Dimensions		760(W) × 970(H) × 680(D)mm

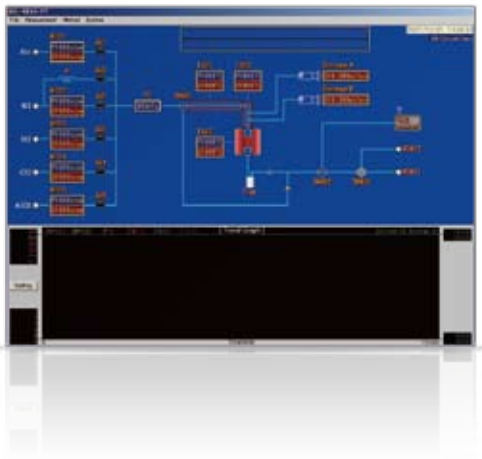
Case4

Application : Biomass to liquid

Biomass refers to dead biological material that can be used as fuel or for industrial production. It includes livestock excreta, raw garbage, wood waste, etc. Since 1990s, biomass attracts lots of attention as an approach to carbon-dioxide emissions reduction or creation of a recycling society.
This BEL-REA is used for studying a process to convert biomass to liquid organic compounds, such as ketones.

Features

- Automatic system control by an user-friendly software.
- Safety design – when the unsafe state is detected, such as earthquake, gas leakage, and over heat, the system enters inemergency mode.
- Small foot print – A window system controller is built inside.
- Special biomass reactor prevents the line from being plugged.



Specifications

Gas and vapor supplier	No. of gas lines	5 (4: reaction gas mixer, 1: purge gas)
	Gas flow control	Mass flow controller (5 units)
	Gas flow rate	100 sccm (Negotiable)
	Vapor generator	Syringe pump + Evaporator (Max. 150°C) × 2 lines
Reactor	Temp. range	RT ~ 800°C
Gas analysis		Gas chromatography
Dimensions, Weight		570(W) × 1700(H) × 700(D)mm (Gas chromatography and the rack are excluded), 100kg

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