

**SPR16
SLURRY PHASE
REACTOR**

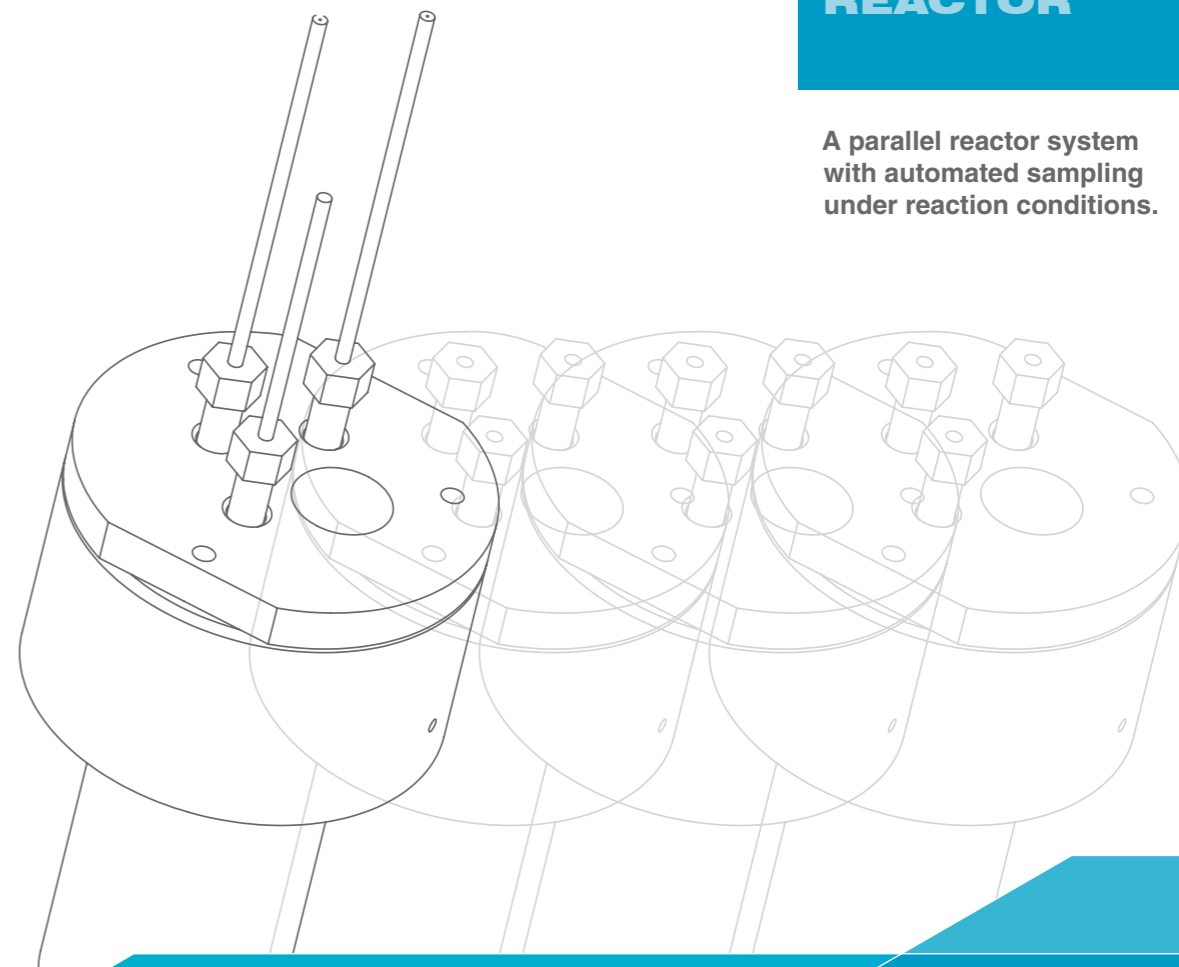


European Patent application is pending

Product Information

**SPR16
SLURRY PHASE
REACTOR**

A parallel reactor system
with automated sampling
under reaction conditions.



Designed for

- Catalyst and Materials screening (primary and secondary)
- Kinetic Studies
- Process optimisation
- Reproducibility and Quality control

... Highest Level of Automation



Introduction

Using parallel reactor systems to investigate multiphase heterogeneous or homogeneous catalytic reactions can improve lab productivity by a factor of 10, accelerating catalyst development and enabling rigorous kinetic studies to be carried out.

The SPR16 is a slurry phase batch or semi-batch reactor system featuring sixteen independently controlled batch autoclaves and unique liquid sampling under process conditions. The SPR16 can therefore be used to investigate sixteen materials at common conditions or one material under sixteen different conditions.

Applications

The reactor vessel design covers a wide range of applications and reaction conditions, and is been validated for a large number of heterogeneous and homogeneous multiphase batch catalytic processes e.g. hydrogenations, carbonylations or hydroformylations, oxidations, hydrogenolysis.

It is therefore an attractive tool for carrying out catalytic studies in the fine chemical, life science and bulk chemical industries.

A range of application notes can be found at www.amtec-chemnitz.de

System

Reactor Array

Each miniaturised autoclave reactor is designed for optimum heat and mass transfer. The small internal volume of 15 ml saves expensive catalyst and feedstock resources. Standard material of construction is stainless steel 316L, other materials like Hastelloy® C276 are available on request. Each reactor is equipped with individually adjustable heating, stirring, and a certified rupture disc in the reactor lid.

Heating and Stirring

The reactors are stirred using cross-shaped PTFE coated magnetic stirrer bars. The stirrers are driven by electronically controlled magnetic fields with no moving parts, and stirring rate is controlled by the magnetic field strength. The stirring speed range is 500-2000 rpm, fulfilling the mixing requirements of most common organic slurries. The stirring rate is independently measured in each reactor using a detection system. Each reactor is heated by an individual electrical heating jacket, and the reactors can be heated to up to 250°C during pre-treatment and 220°C during reactions.

Specifications

The specifications presented are for standard model, other systems can be built on request for specific applications.

System

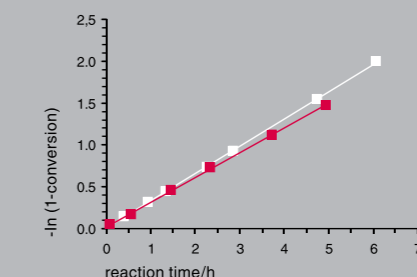
- > 16 independent batch reactors
- > Individual temperature, pressure and stirring speed in each reactor
- > Automated feeding of gas and liquids
- > Liquid sampling under process conditions
- > O-ring reactor sealing mechanism
- > Graphical user interface, different operator levels
- > Historical trending of all process parameters

Standard Operating Limits

- > Reactor volume 15 ml
- > Operating pressure up to 150 bar
- > Operating temperature up to 250°C for pre-treatment, 220°C for reaction
- > Stirring speed 0 - 2000rpm

calculated k-values

- > PREMEX 1.38 h⁻¹
- > SPR16 1.35 h⁻¹

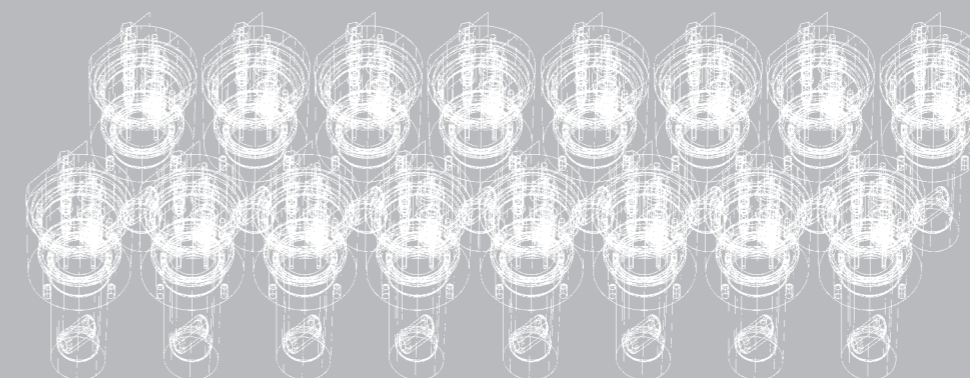


Crotonaldehyde conversion in heterogeneously catalysed crotonaldehyde hydrogenation in n-hexane using a Pd/C catalyst: comparison of results obtained in 100 ml PREMEX autoclave and SPR16 reactor.

System Dimensions

- > 1600 x 900 x 1950 mm (Width x Depth x Height)

SPR16 SLURRY PHASE REACTOR



16x

Fully Automated

- > reactor vessels
- > heating
- > stirring
- > liquid supply
- > gas supply
- > sampling

Automated Gas & Liquid Feeding

All 16 reactors are connected to gas and liquid supplies via a selection valve system. A pressure sensor is used in combination with a Mass Flow Controller for gas supply in order to control the pressure in the reactors. The number of feed gases is customer specific (two reactant gases and one inert gas as standard). An integrated HPLC pump is used to fill the reactors with liquid solvents and reactants under pressure. Each reactor can be fed with different amounts and types of liquids and gases, and can be operated at an individual pressure. Air sensitive liquids and homogeneous catalysts can be fed into the reactors either directly under inert gas flow or using the integrated injection valve.

Sampling

A novel technique enables automated and reproducible liquid sampling under process conditions without disturbing the reaction. Multiple samples can be obtained from each reactor because of the small sample volume, in this way liquid composition can be monitored as a function of time. (standard sample size is 100µl, a range of sizes is possible). The samples are injected into standard vials via an integrated robotic system for subsequent analysis using chromatographic or spectroscopic methods. Samples can be automatically diluted using an integrated pump and customisation of the sampling process for online analysis is also available.

Automation & Data Management

The entire system is controlled via a PLC in combination with a control PC for visualisation, experiment selection and manual control. The graphical user interface allows manual operation and visual depiction of the system status. A scheduling tool is provided for experimental planning, the specific experimental subroutines can be adapted to meet the specific application requirements. Process and sample data is stored in a MySQL database, and results from most analysis devices can be integrated. All process parameters can be viewed in tabular and graphical form during experiments. System status can be remotely monitored via a LAN connection using a standard web browser.

Safety

A programmable safety PLC is integrated within the system to manage alarms. Multiple alarm classes are featured, and the alarm settings and responses can be adapted to meet on-site safety regulations.