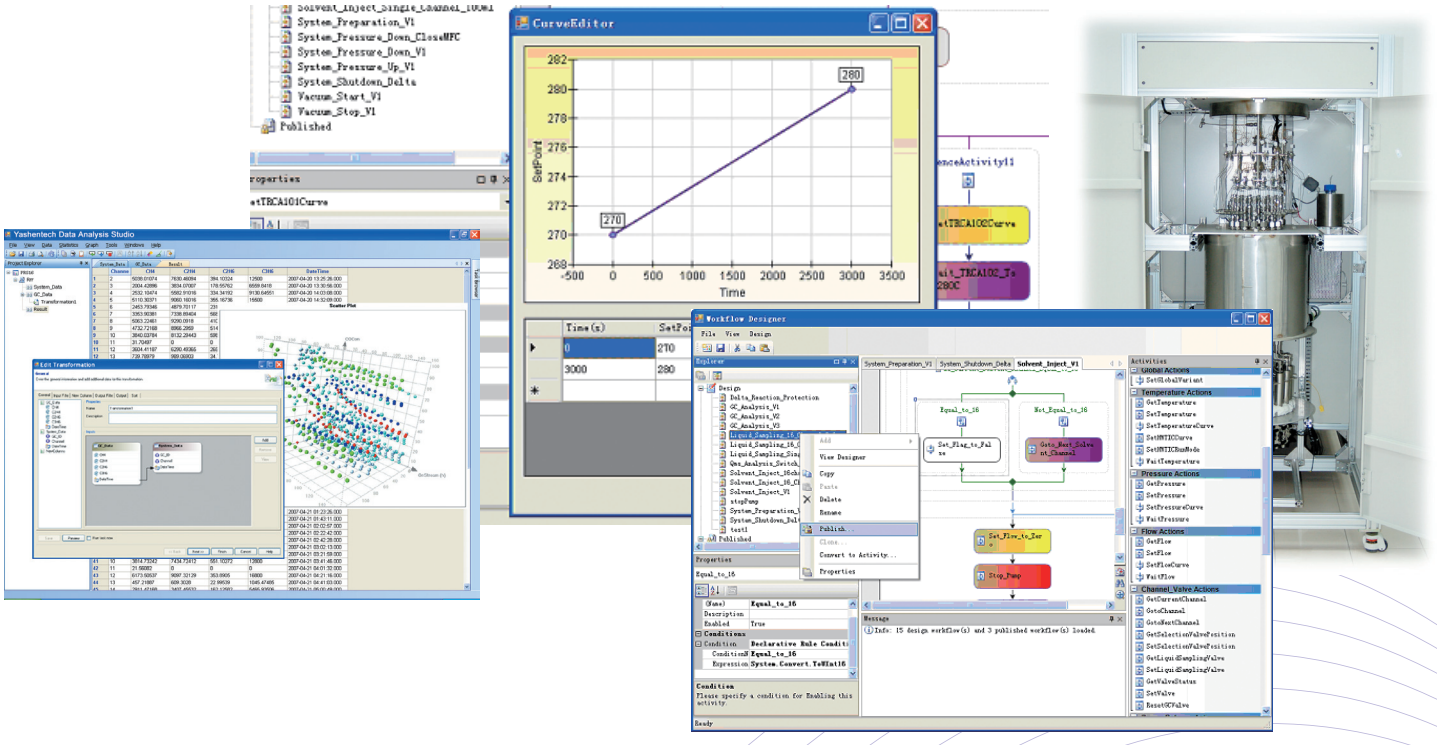
PRS16

亚申高通量平行反应器系统 PRS–16

YASHEN HIGH THROUGHPUT Parallel Reactor System PRS-16

用途广泛、高效可靠的最新型多通道固定床平行反应器系统

State-of-the-art parallel fix-bed reactor system with wide range of applications with high efficiency.



PRS-16广泛适用于气相或滴流条件下催化剂及反应工艺条件的各类评价，包括催化剂筛选、多元催化剂的组成筛选和优化、反应条件及工艺优化、催化反应动力学研究、催化剂寿命考察等。

PRS–16系统集成整合了并行实验、自动控制、信息处理等技术，运用材料研发的“流水线”，大大提升科研产能，比传统反应器更多、更快、更好、更省。

多个/多种PRS–16平行反应器系统还可进行平行组合，从而进一步提高研究及操控的效率和灵活性。

YASHEN PRS-16 has a wide range of operating windows (pressure, temperature, flow, and catalyst loading) to enable high process flexibility so that various gas phase and trickle bed applications can be investigated, including catalyst screening and testing, reaction condition optimization, reaction kinetics study and catalyst lifetime testing, etc.

PRS-16 provides high quality and reliable data through cutting-edge engineering technology and seamless integration of state-of-the-art software.The integrated easy-to-use software enables automated high throughput experimentation. A common software platform for experimental design, execution, tracking, analysis, and evaluation maintains high flexibility and reliable operations.

Combination of a variety of PRS-16 systems can further increase the efficiency and flexibility

平行性：所有通道在相同实验环境下平行反应，减少/消除系统误差

Uniformity: Uniform flow and temperature across all 16 channels

精确性：催化剂筛选和评价系统床层温差和各通道间温差：小于±0.5 度；动力学系统床层温差和各通道间温差：小于±0.1 度

Precision: Channel to channel temperature uniformity less than ±0.5 ℃ for normal system; less than ±0.1 ℃ for system used for kinetics study

适用性：适用于气体、液体或气液同时进料；适用于气固、液固、气液固反应；允许大范围催化剂装填体积和大范围的反应温度和反应压力；同时可以集成多台各类分析仪器（如GC、MS、IR 等）在线/离线仪器，提高分析通量；在线，离线采集样品

Flexibility: Wide range of operating windows (pressure, temperature, flow, and catalyst loading) to enable high process flexibility in various gas phase and trickle bed applications; high throughput online/offline analysis

便捷性：功能强大的商业级系统软件支持，数据同步集成，操作简便。包括：组份和库设计包、催化剂制备电子记录本、实验和系统软件包、数据分析和建模工作室

Easy-to-use: Integrated user-friendly software for experimental control, system monitoring, data processing, etc.

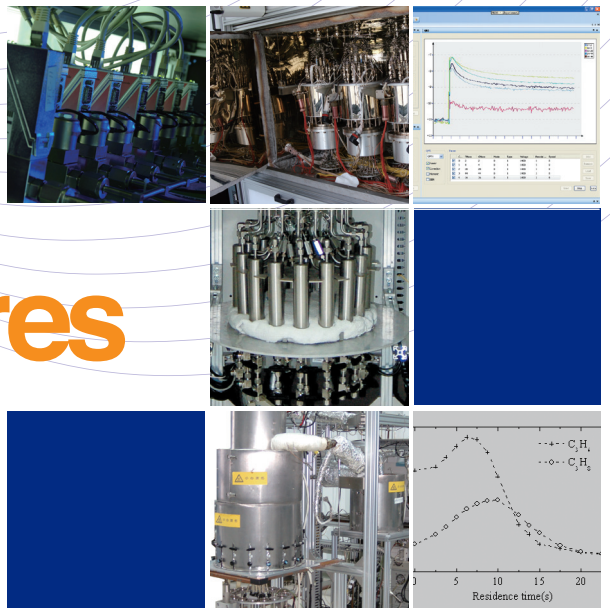
安全性：可集成多种气体探头；超压、超温报警；误操作保护；停电、停气处理等

Safety: Over-limit protection of pressure and temperature, auto shut down for gas leakage, utility failure, according to user predefined safety procedures

扩充性：可根据客户需求定制16至数百通道平行反应器，提高实验速度上百倍

Expandable: System with 16 to hundred channels can be customized

系统特点
Features



亚申高通量平行反应器系统PRS-16助您实现多重任务

A Versatile System for Catalyst Development

- 催化剂筛选和评价 Catalyst screening and testing
- 催化反应条件筛选研究 Catalytic reaction condition screening
- 催化反应动力学研究 Catalytic reaction kinetics study
- 催化反应传质传热研究 Mass and heat transfer study
- 催化反应工艺过程研究 Processing optimization
- 催化反应工艺模拟建模、放大 Process modeling and scale up
- 催化剂寿命考察 Catalyst lifetime testing

应用领域 Applications

石油化工 加氢反应 – 加氢裂化，加氢脱硫、脱氮，选择性加氢等；氧化反应；异构化反应；聚合反应

煤化工 合成气转化 – 费托反应，甲醇、乙醇、高碳醇、多元醇合成，洁净汽油、柴油合成

甲醇转化 – 甲醇制烯烃、丙烯、汽油，甲醇制二甲醚，甲醇制碳酸二甲酯

天然气化工 天然气水蒸气重整；天然气二氧化碳重整；联合重整

环境保护 烟气脱硫、脱硝；汽车尾气处理；空气污染催化治理；废水处理

生物质转化 生物柴油；生物乙醇

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Petroleum Chemistry Hydrogenation: hydrocracking, HDS/HDN, selective hydrogenation; Oxidation; Isomerization; Polymerization

Coal Chemistry Syngas conversion: Fischer-Tropsch reaction, Methanol/Ethanol/Higher alcohols/Polyalcohol synthesis, Clean gasoline/diesel; Methanol conversion: MTO/MTP/MTG, Methanol to DME, Methanol to DMC

Natural Gas Chemistry Stream reforming, CO_2 reforming, Combining reforming

Environment Protection De NOx/SOx, Automobile emission treatment, Air pollution treatment, Wastewater treatment

Bio-derived Feedstock Transformations Bio diesel; Bio ethanol

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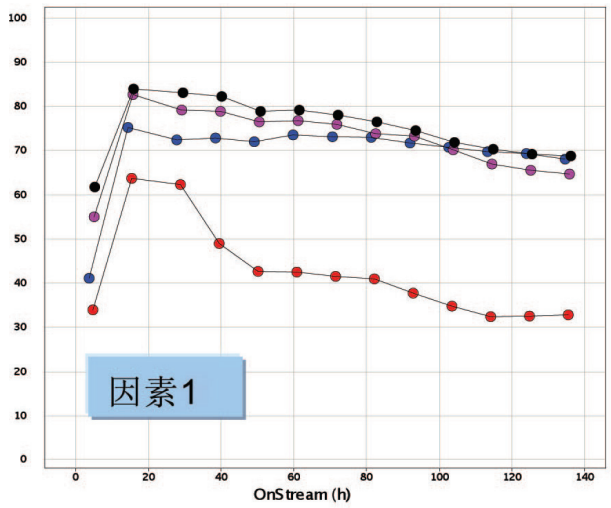
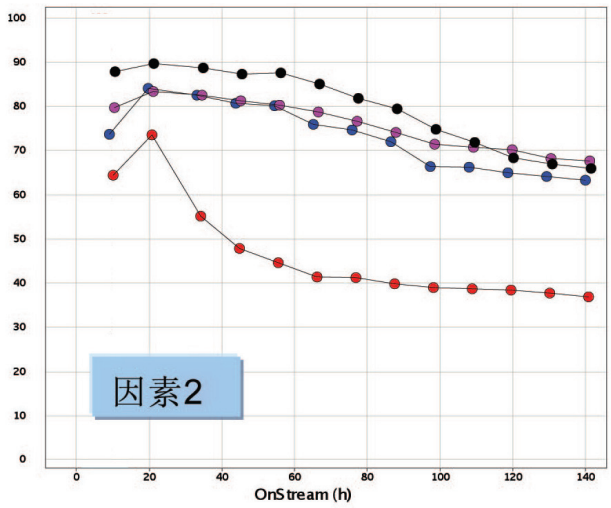
亚申高通量平行反应器系统PRS-16应用实例
Case Studies

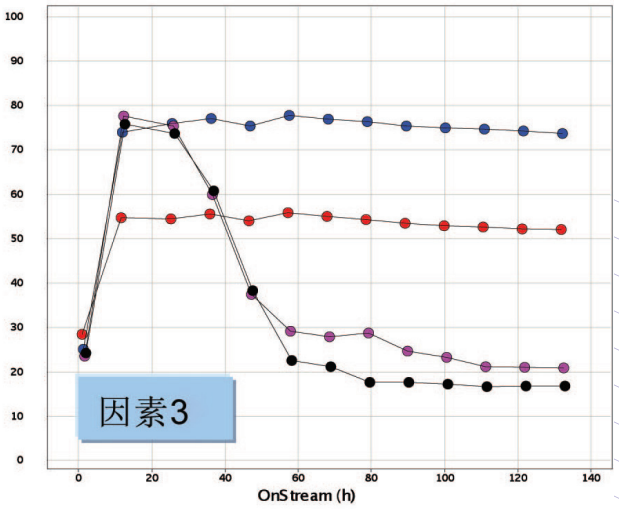
实例1：催化剂制备因素筛选
Case 1: Catalyst preparation study

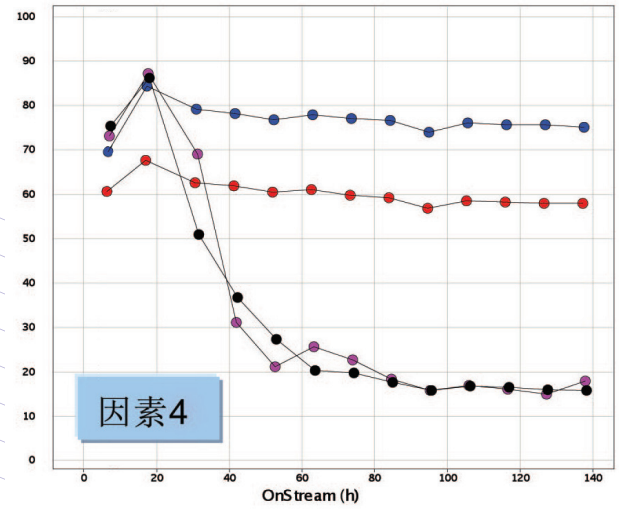
PRS-16同时考察4种制备因素对同一催化剂性能的影响

Study 4 sets of preparation effects in one run using PRS-16





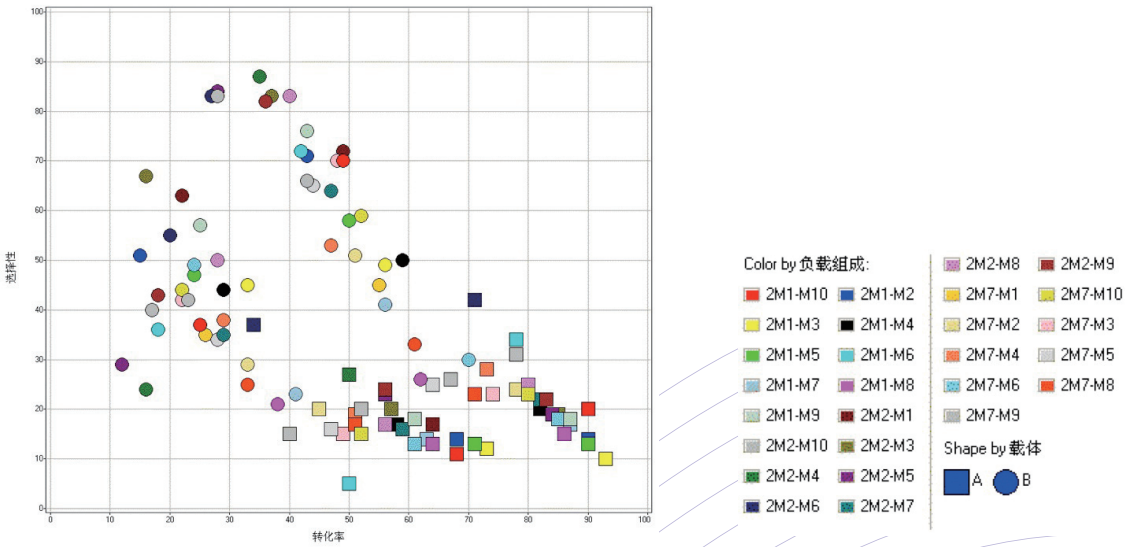




实例2：负载金属催化剂筛选
Case 2: Metal-supported catalysts screening

PRS–16考察负载金属催化剂载体和负载金属组成及含量的影响

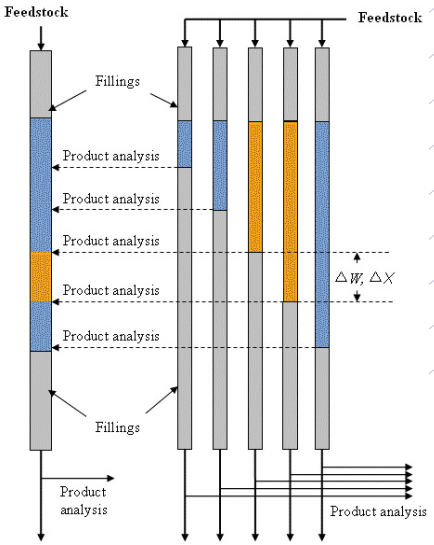
Study the effects of catalyst support, supported metal and metal loading using PRS–16

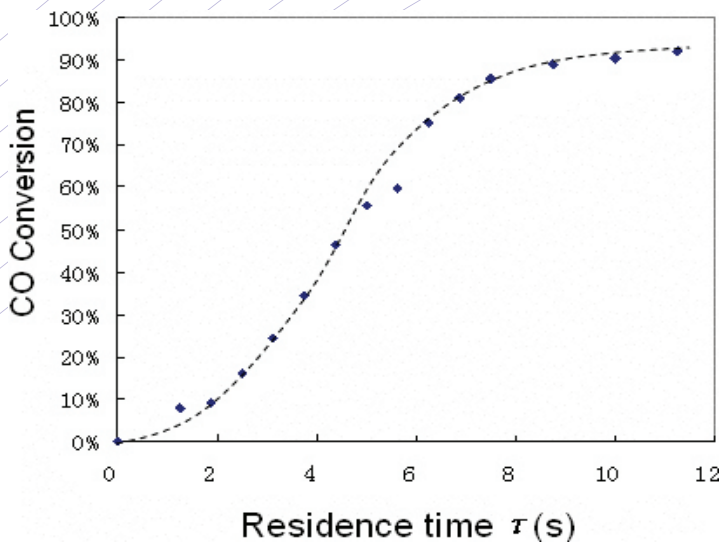


实例3：催化反应动力学
Case 3: Catalytic reaction kinetics study

用PRS–16同时装填不同量催化剂进行相关动力学研究

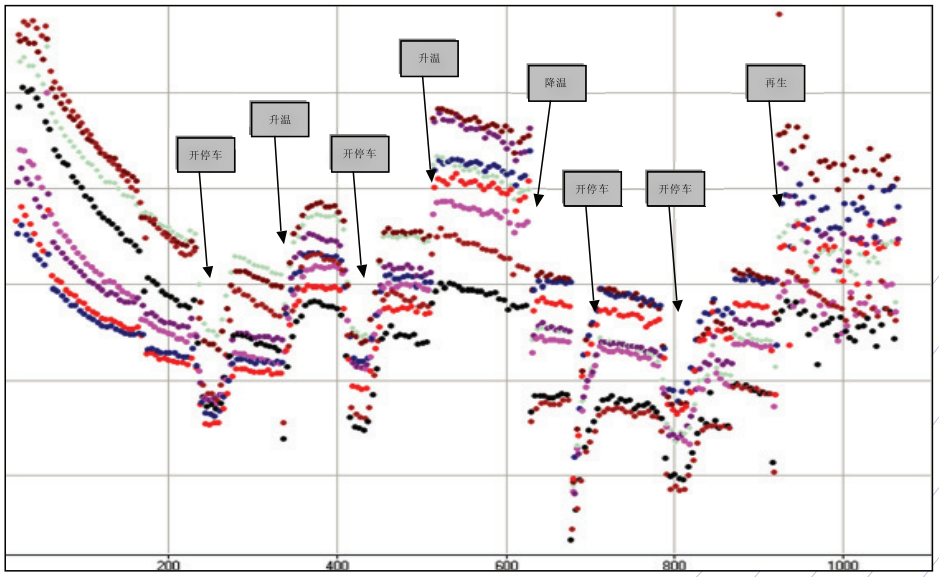
Study the catalytic reaction kinetics through different catalyst loadings using PRS-16





实例4：催化反应条件及工艺研究
Case 4: Reaction conditions and processing study

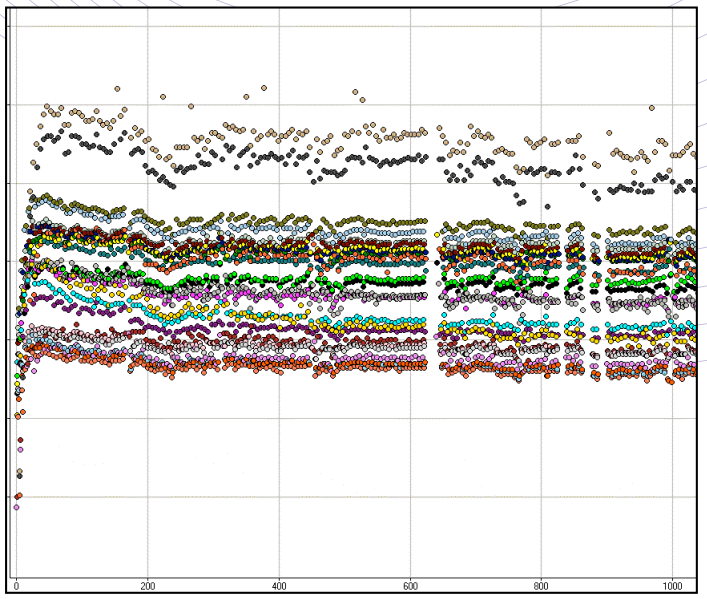
PRS–16同时进行16个催化剂开停车，升降反应温度及再生影响的研究
Simultaneously study the effects of reaction conditions and processing parameters of 16 catalysts using PRS–16



On Stream (h)

实例5：催化剂寿命
Case 5: Catalyst lifetime testing

两套PRS–16同时考察32个不同催化剂的寿命（TOS>1000小时）
Simultaneously test the lifetimes of 32 catalysts using two PRS-16 systems



On Stream (h)

亚申高通量平行反应器系统PRS-16系统参数
Specifications

项目 Item	参数 Parameter	可否定制 Customizable
反应通道 Reactor Channel	16	√
催化剂体积 (ml/每通道) Catalyst Volume (ml, per channel)	0.5, 1, 5, 10, 20, 50, 100	√
催化剂床层高径比 L/D Catalyst Bed L/D	8 to 50	√
最高操作温度 (°C) Max Operating Temperature (°C)	500, 750, 1000	√
催化剂床层温差 (°C) Catalyst Bed Temperature Uniformity (°C)	+/-0.5	√
各通道之间温差 (°C) Channel to Channel Temperature Uniformity (°C)	+/-0.5	√
进料分配误差 (RSD) Feed Distribution Uniformity (RSD)	1%	√
进料预处理 Feed Pretreatment Options	净化、预热、预混和 Purification, preheating, premixing	√
气体进料流数量 Number of Gas Feeds	2 或 依客户要求 2 or per customer request	√
液体进料流数量 Number of Liquid Feeds	1 或依客户要求 1 or per customer request	√
下游分离设备 (每个通道) Downstream Separator Option (Per Channel)	温度可控冷凝器 Temperature controlled condenser	√
最大操作压力(bar) Max Operating Pressure (bar)	100, 150, 200	√
在线液体取样和补偿 On-stream Fluid Sampling and Discharge	人工、半自动、全自动 Manual, semi-automatic, or fully automatic	√
最高液体进料温度 (°C) Max Liquid Feed Temperature (°C)	150	√
反应器材质 Reactor Materials	SS316, 哈司特镍合金 C22 或依客户要求 SS316, Hastelloy C22 or customer specification	√
产物分析 Analysis	离线、在线气相色谱或质谱可选 Offline, Online GC or MS analysis available	√
安全 Safety	硬件程序控制和软件双重对温度和压力实行过限保护，在出现泄漏、功能失控、以及用户预设的安全问题时自动关机。 Over-limit protection of pressure and temperature both at hardware (PLC) and software level (control-computer), auto shut down for leakage, utility failure, user predefined safety procedures	√