



Chemspeed offers Automated Workstations and Partial or Entire Product Development Solutions

SMOLE, SMOLEFIN - Paradigm Shift in Polyolefin R+D and QC

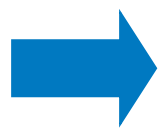
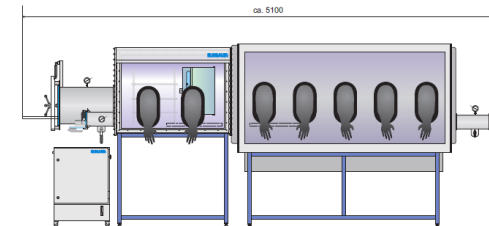
**Standardized & Accelerated
Catalyst Synthesis, Screening, Optimization, Storage**

28th February 2017

Dr. Michael Schneider
Sr VP, BU Materials Science

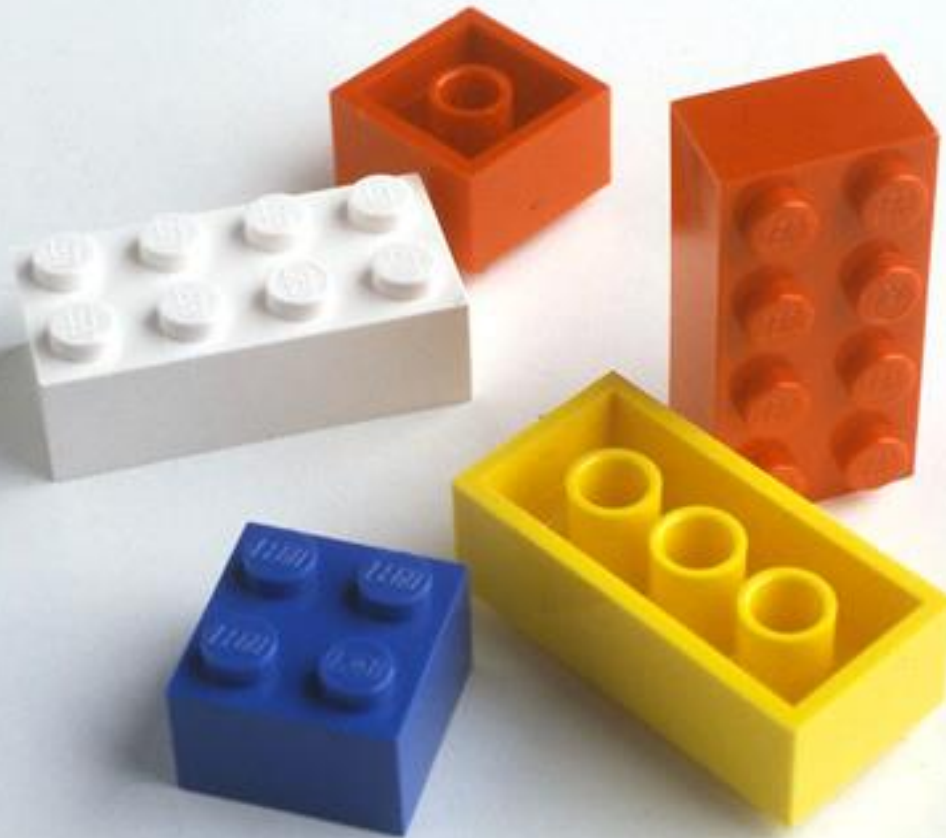
You certainly face challenges in polyolefin catalysts R&D like ...

- Coping with significant volume growths
- New and / or better catalysts lacking from limitation of traditional experimental work
- Bans on commonly used additives
- Push to release innovative highly effective / specialized products quickly
- Single catalyst assembly in days - inherently restricting catalyst diversity for optimized product and / or new product performances
- Lack in quality and reproducibility
- Catalysts synthesized are typically one-off, no sustainable knowledge preservation
- ...



Standardized and accelerated polyolefin R+D with ultimately standardized catalyst logistics

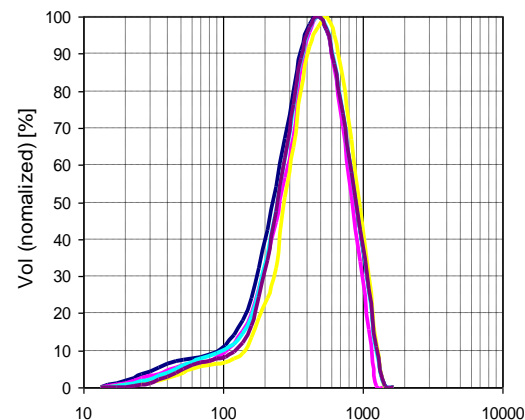
What if handling of toxic or sensitive compounds in small amounts became that easy?



Selection of Approved Customer Testimonials

Sinopec:

“I am very pleased to expand the implementation of high-output research in Sinopec,” said Vice President at Sinopec BRICI. “Chemspeed has been an excellent company providing us a convincing solution for the highly challenging automated polyolefin catalyst synthesis and subsequent reformatting, in particular SMOLEFIN. I believe these tools will provide a strategic advantage to our R&D organization in our effort to rapidly develop novel catalysts for local and global use. In addition to accelerating and standardizing experimentation, the Chemspeed solution also enables R&D data under one informatics platform which will help Sinopec BRICI scientists to be more productive and innovative.”

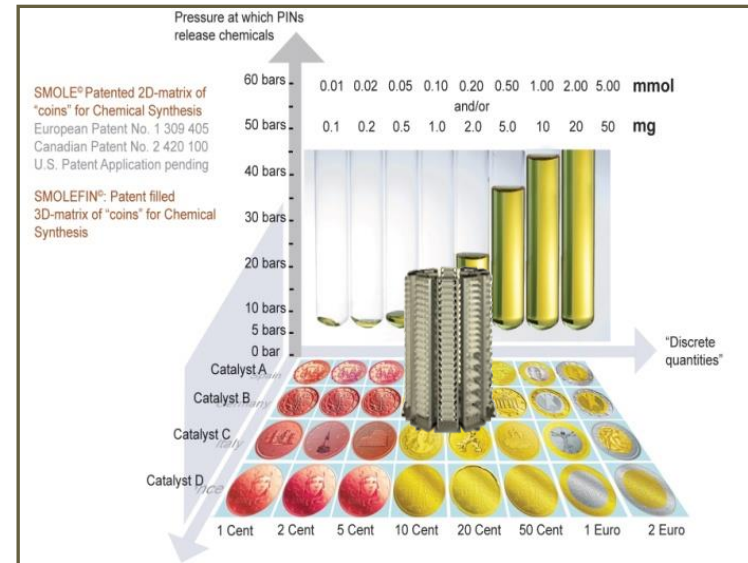


Petrochina Research Institute:

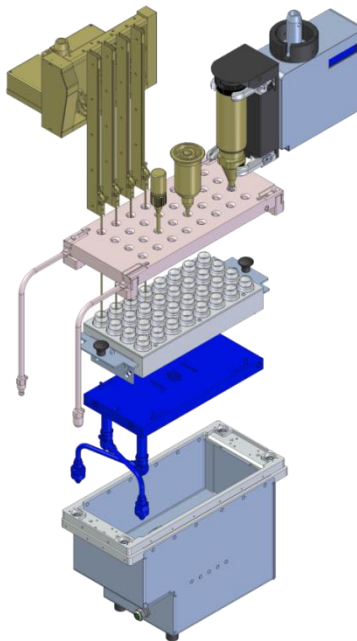
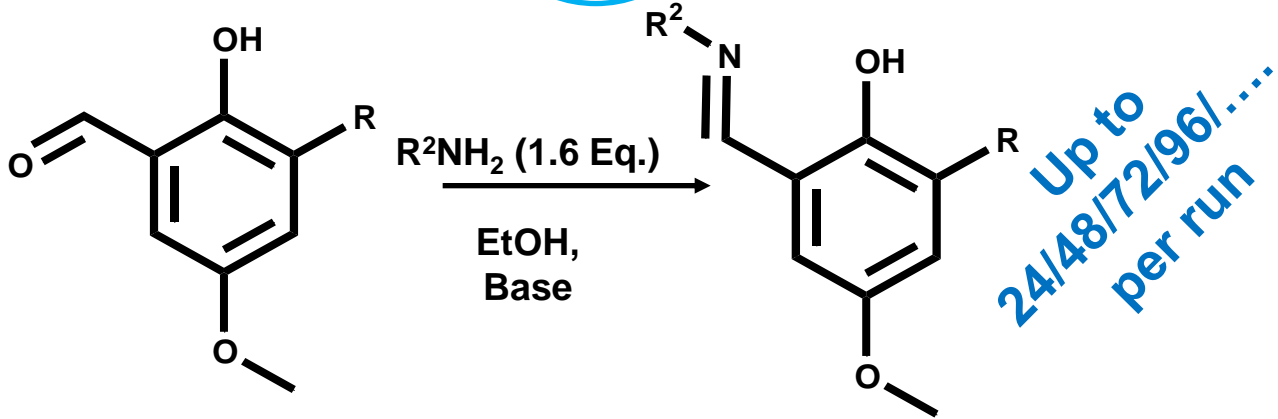
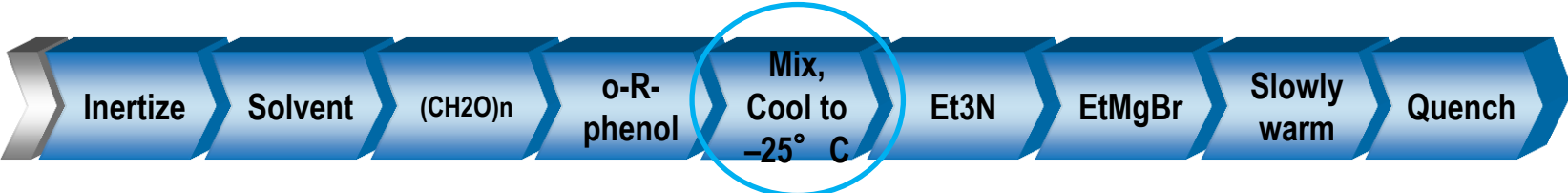
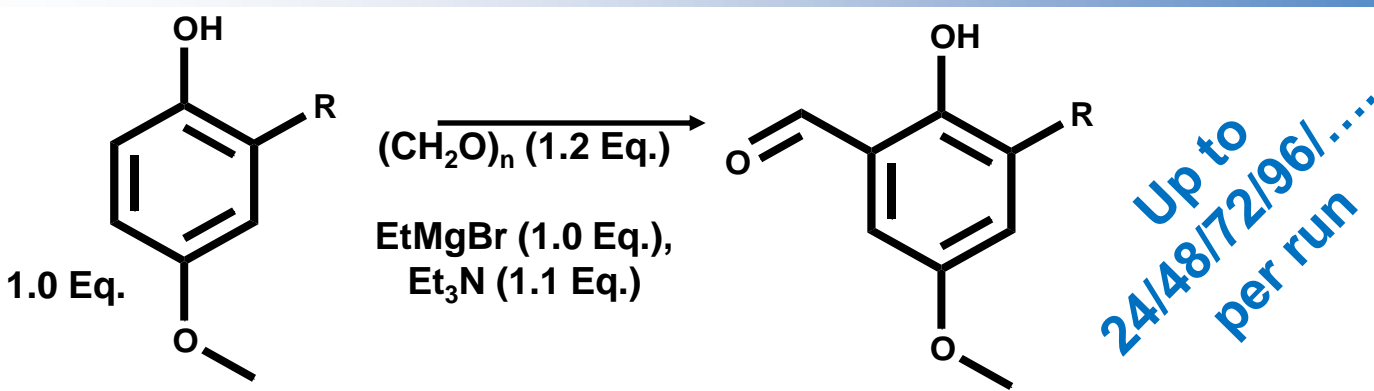
“In order to accelerate and standardize its Polyolefin R+D, PetroChina Research Institute (PRI) in Beijing PRC, has chosen Chemspeed’s High-Throughput & High-Output Workflows for Polyolefin Catalyst Synthesis and Screening based on Chemspeed-pioneered, fully automated integrated ISYNTH array reactors, fully automated well-plate format based pressure screening reactor, as well as fully automated, individually controlled and operated process reactors in conjunction with its proprietary unrivalled overhead gravimetric dispensing of solid, liquid and highly viscous liquid raw materials.”

Agenda

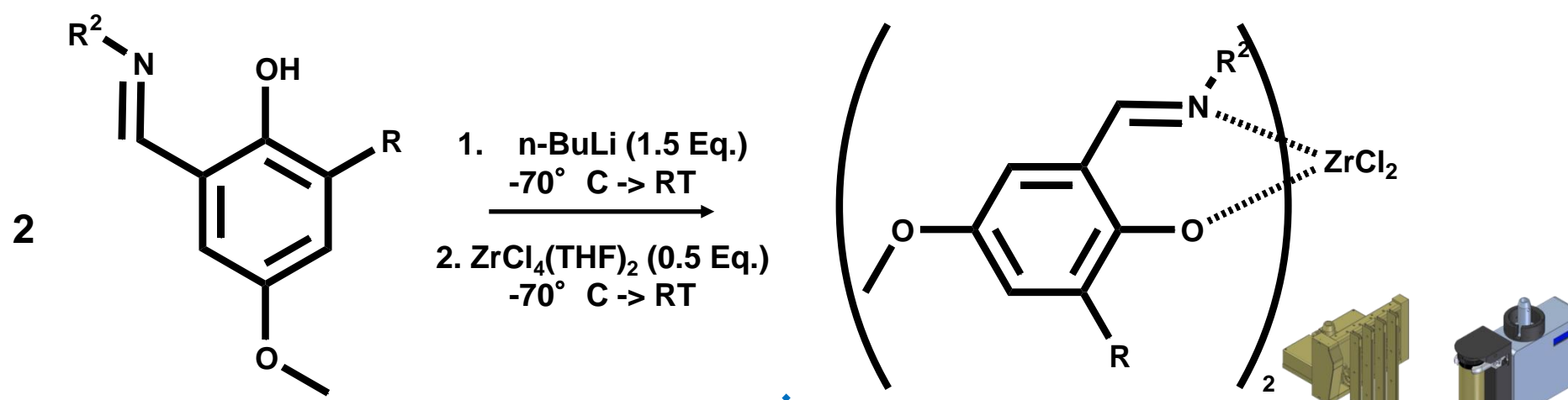
- **Snapshots for enabled polyolefin catalyst and polyolefin synthesis**
- SMOLEFIN - Paradigm shift in polyolefin and rubber R+D and QC
- Innovation enabling R+D technologies
- Company
- Summary



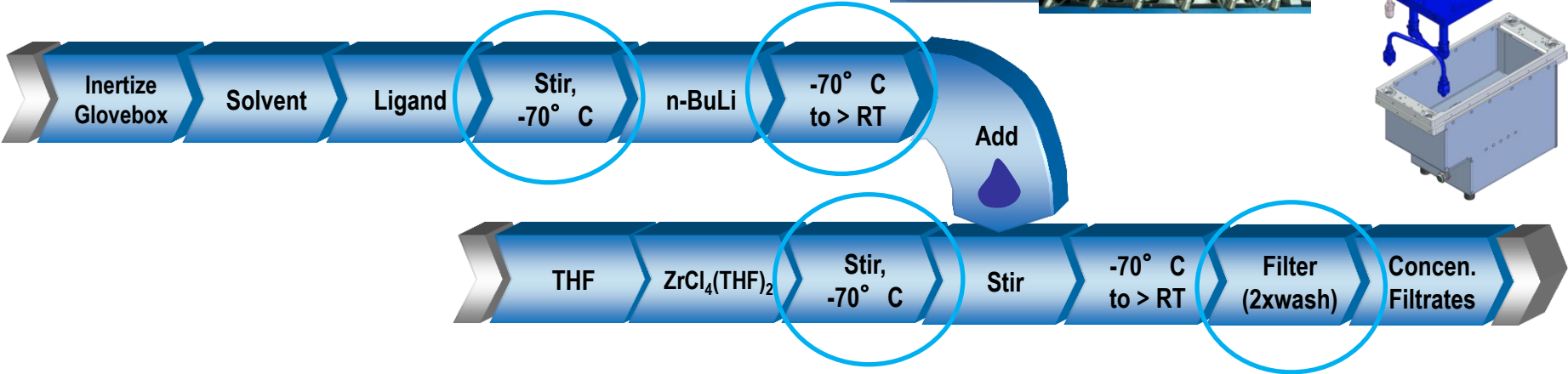
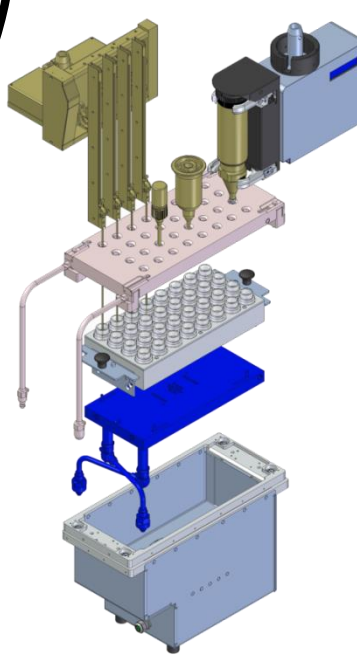
Case study – single site ligand synthesis



Case study – single site catalyst synthesis

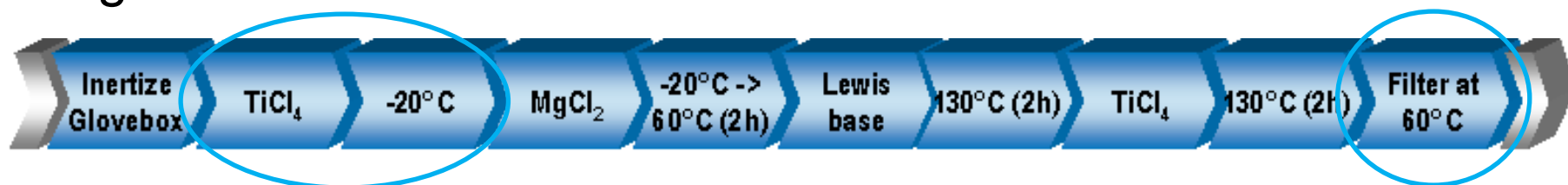


Up to
24/48/72/96/...
per run



Case study – ZN-catalyst synthesis

Ziegler-Natta

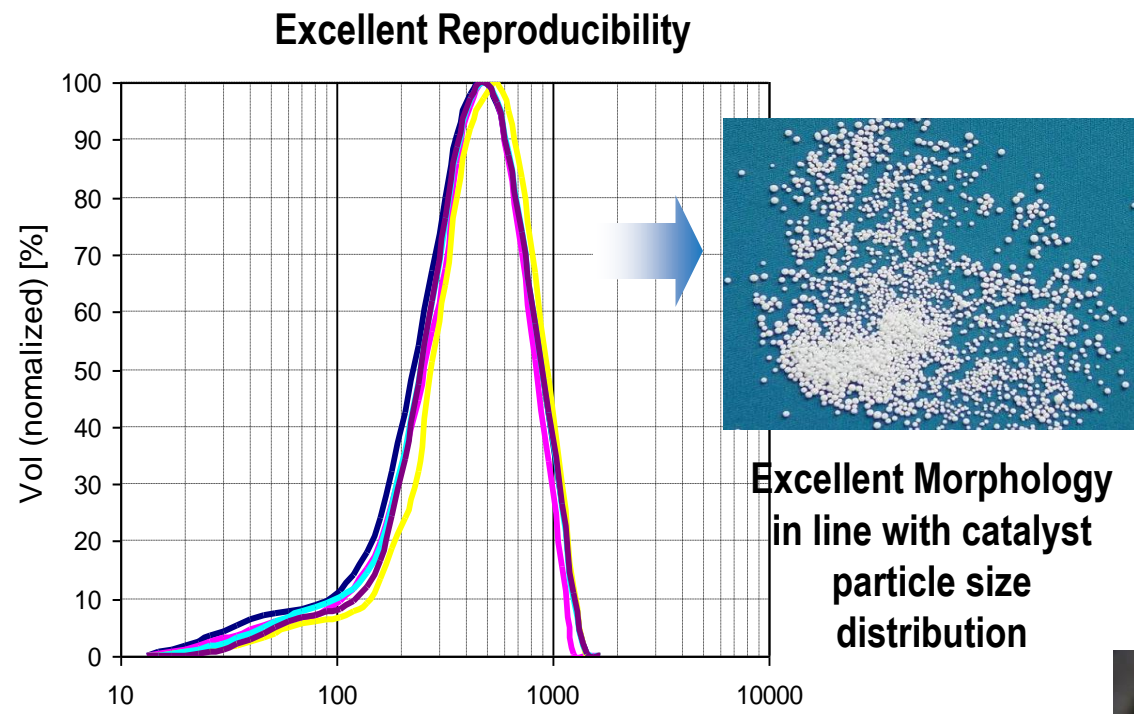
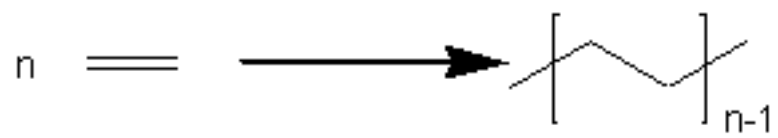


Hermetically closed continuous feed supply lines for e.g. TiCl₄ with reactor cooling down to -50° C

Up to 24 per run



Case study slurry-phase PE – PSD reproducibility



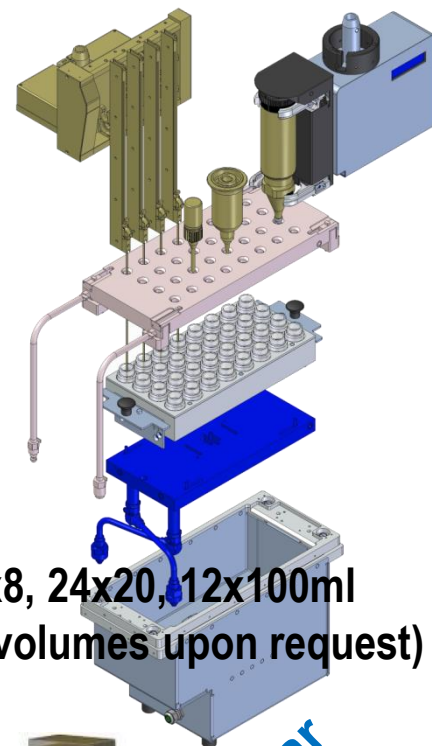
High-precision
mixing, heating,
feeding control



ISYNTH reactors - generic applications for polyolefin and rubber R+D

- Ligand synthesis
- Donor synthesis
- Organometallic synthesis

Video: [ISYNTH](#)



48x8, 24x20, 12x100ml
(other volumes upon request)

Video: [MTP pressure block](#)



Up to 100bar
AND
Up to 250°C

- Solution-phase screening, incl. prepolymerization
- Slurry-phase screening, incl. prepolymerization

Video: [ISYNTH](#)

96x1, 48x2, 24x8, 12x20ml
(other volumes upon request)

Process Research Reactor – generic applications for PO R+D

- Ligand synthesis scale-up
- Organometallic synthesis scale-up
- ZN catalyst synthesis
- Prepolymerization
- Solution-phase
- Slurry-phase
- Bulk-phase
- Gas-phase
- Multi-stage, e.g. pre-polymerization -> bulk-phase -> gas-phase



Video: 100 ml process reactors

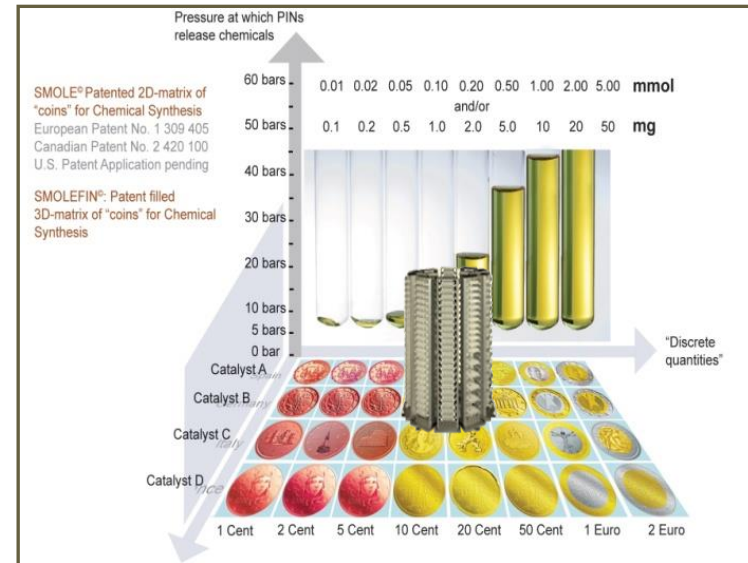
100, 250, 1000ml
(other volumes upon request)

With individual sets of conditions for each reactor!

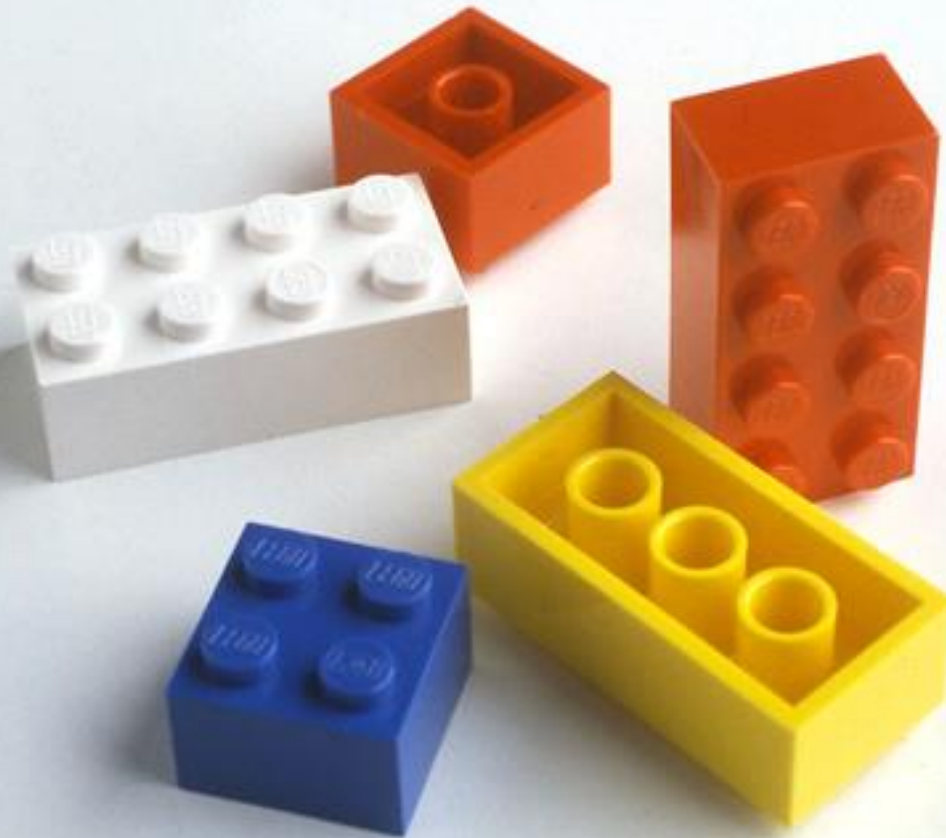
Up to 100bar
AND
Up to 250°C

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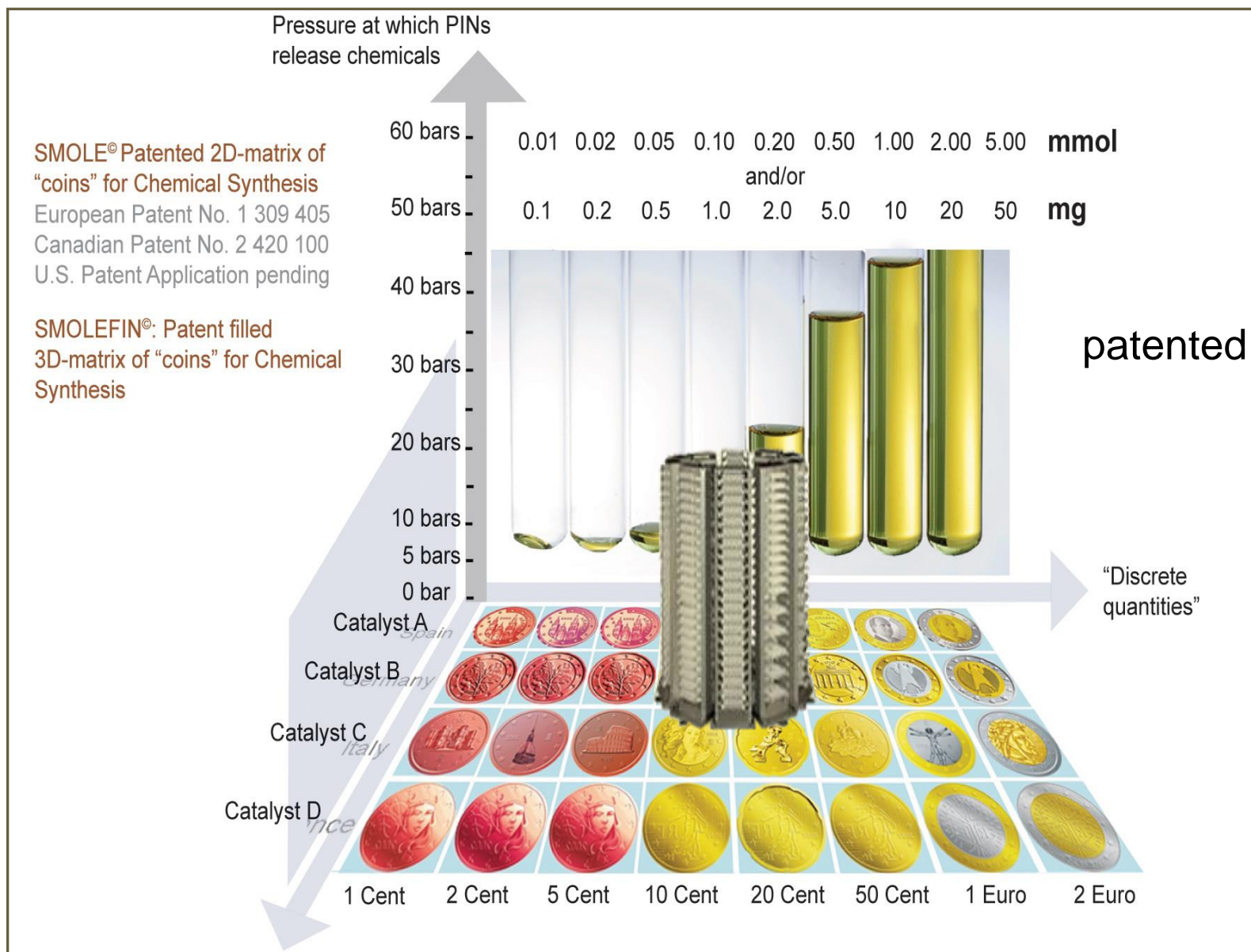
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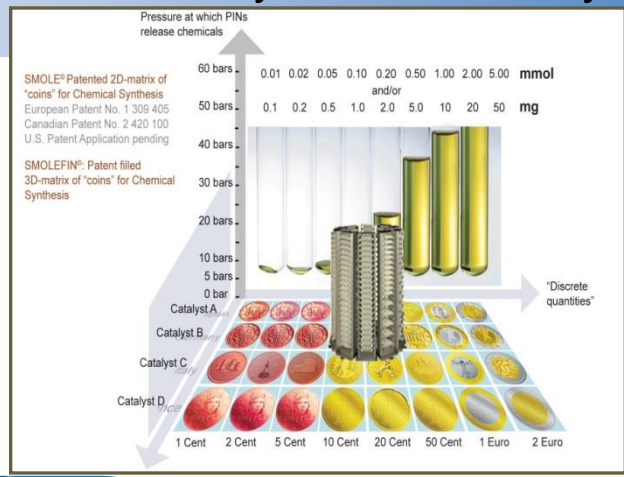


SMOLEFIN - 3-dimensional, ready-to-apply chemicals library

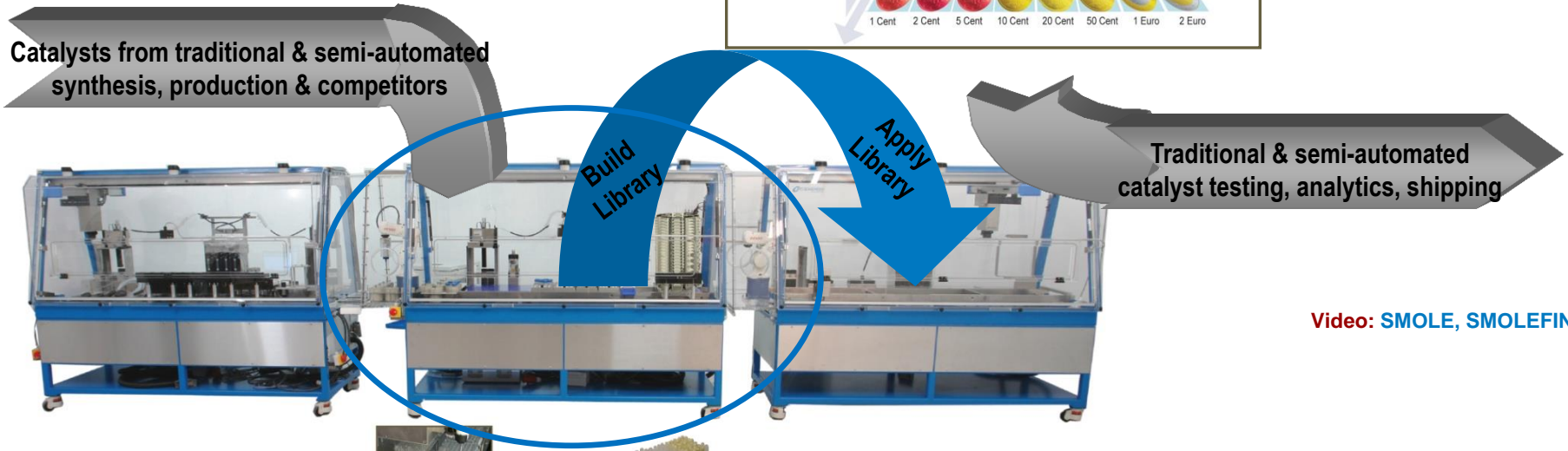


Polyolefins Rubbers Master Workflow - evolutionary extension of your workflow at any time

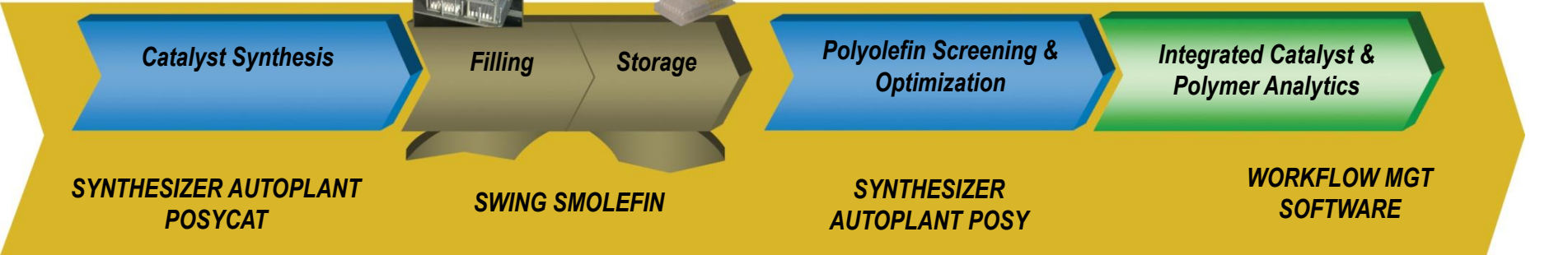
- Homogeneous and Heterogeneous Catalyst Synthesis
- Ligand and Donor Synthesis
- Reformatting / Storage
- Screening
- Optimization
- QC
- Competitor Benchmarking
- DoE, Data Management



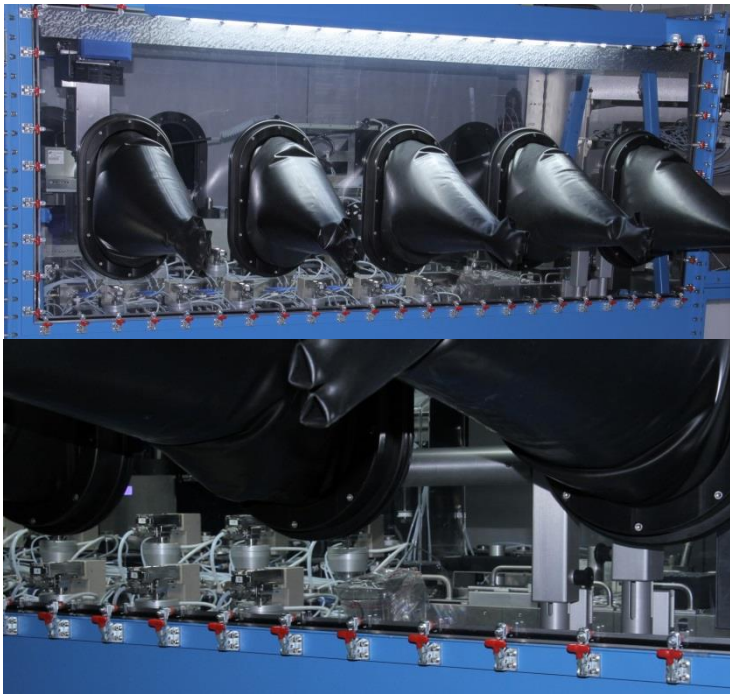
**Globally
Standardized,
Ready-to-Apply
Library**



Video: [SMOLE](#), [SMOLEFIN](#)



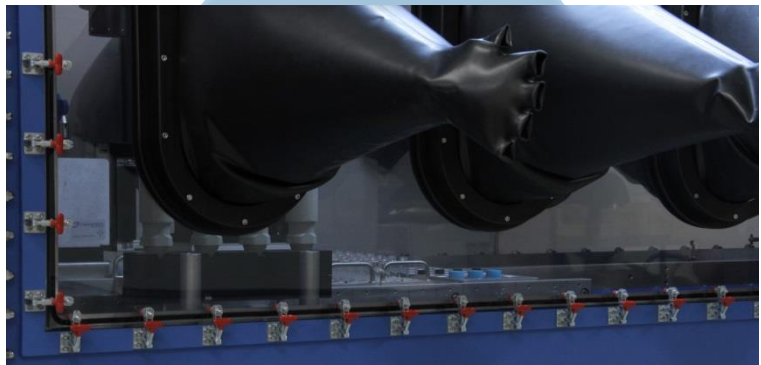
Customer example – AUTOPLANT POSYCAT & SWING SMOLEFIN



AUTOPLANT POSYCAT

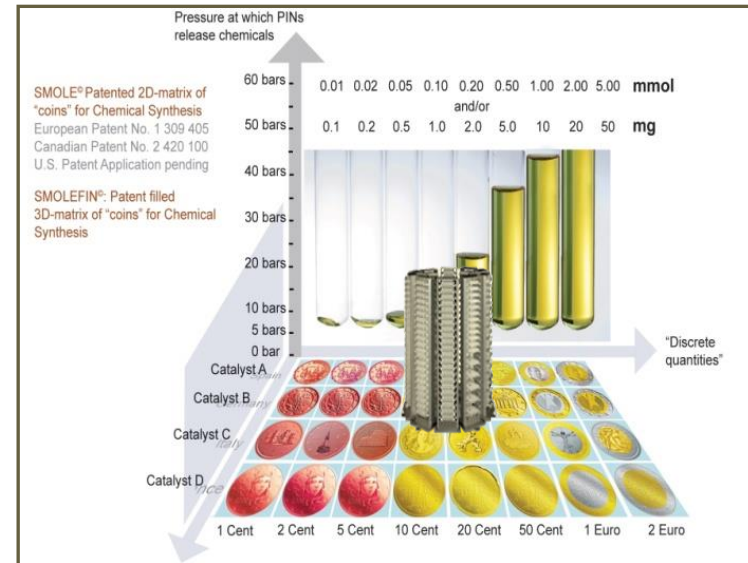


**SWING SMOLEFIN
(and / or AUTOPLANT POSY)**



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Company Product Lines - No 1 in Workflow Platforms

All product lines designed on one hardware and software platform

- Sample Preparation
- Synthesis
- Process Dev.
- Formulation
- Application
- Testing



- Workflow Management Software

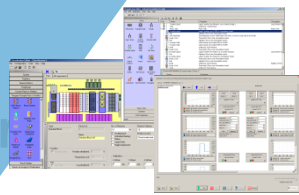
For Product Development in Different Markets

4 Dimensions of Scalable Flexibility and Modularity

All product lines designed for a single software platform

- Sample Preparation
- Synthesis
- Process Dev.
- Formulation
- Application
- Testing

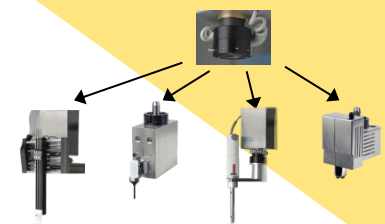
Complete intuitive, flexible, software solution: design, execute, analyze, report (variety of 3rd party software, e.g.: JMP, Spotfire)



Variety of 3rd party instruments e.g.:
rheometer, centrifuge,
microwave, GC,
HPLC, GPC, NIR,
PSD, cryostats,
vacuum pumps, ...



More than 60 robotic tool-features available (patented)



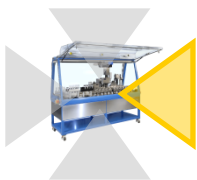
Video: [Tool-Exchange](#)

Broad selection of
racks, vials, plates,
precision reactors and
formulation vessels /
blenders



Workflow Management Software
For Product Development in Different Markets

Chemspeed's knowledge & uniqueness - gravimetric substance handling



Overhead gravimetric dispensing of solids, liquids, viscous liquids, pastes, waxes from sub mg to 100's of grams (patented)

Video:
Solid dispensing
(submg to mg)

Video:
Solid dispensing
(20 g)

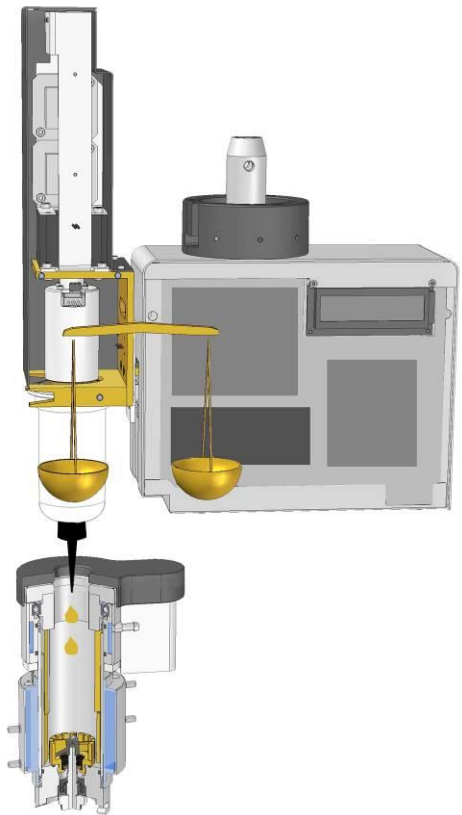
Video:
Solid dispensing
(100 g)

Video:
Liquid dispensing
(submg to mg)

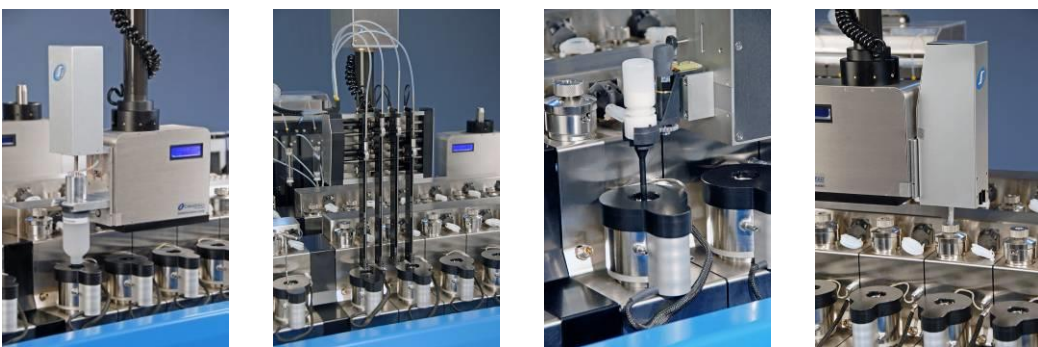
Video:
HV dispensing
and aspirating

Video:
V dispensing
and aspirating

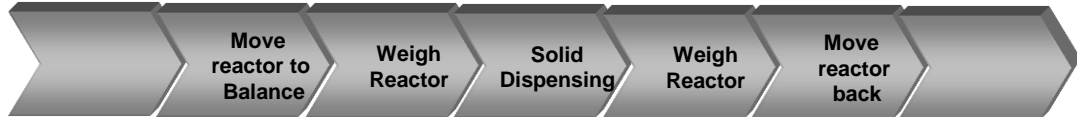
Video:
Wax dispensing



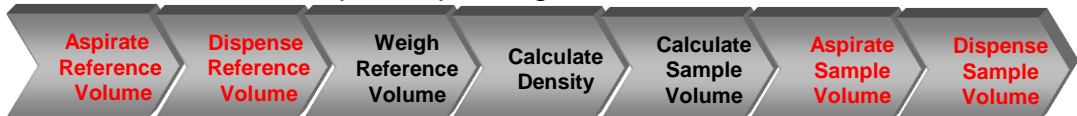
Overhead gravimetric dispensing directly into conditioned, measured, stirred reactors
Robotic Tool Integrated Balance, resolution 0.1 mg
Additional Desktop Balance, resolution 0.01 mg



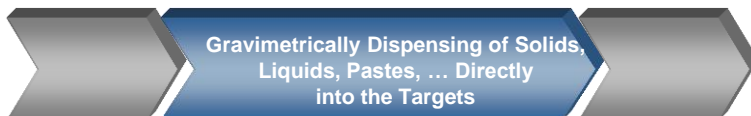
Classical workflow - solid dispensing



Classical workflow - liquid dispensing

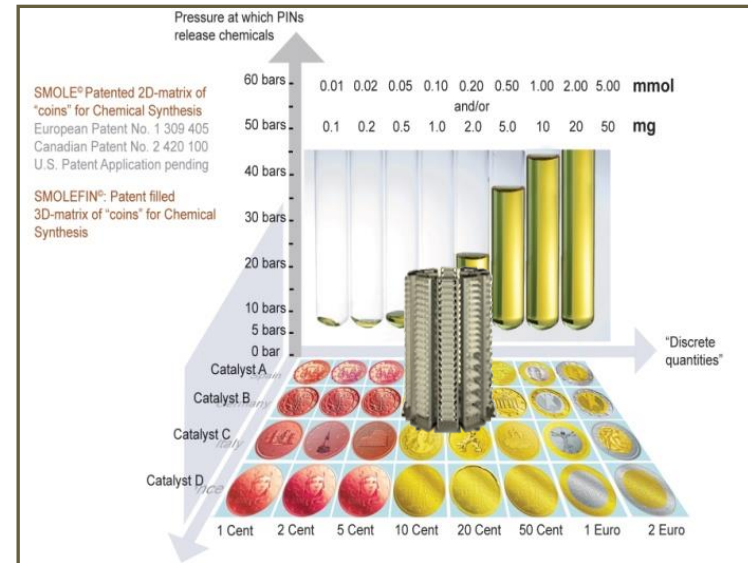


Chemspeed's way: **condensing multiple time-consuming, error-prone operations in one task**



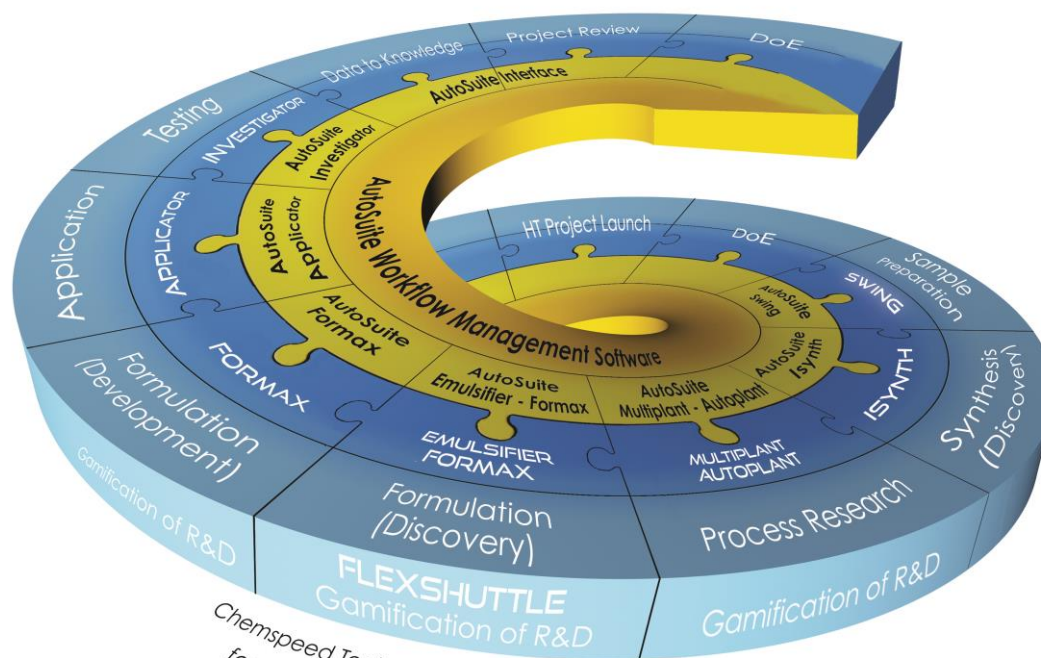
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About Chemspeed

Chemspeed Technologies is the leading provider of high-throughput and high-output research & development workflow-solutions from single bench-top / standalone automated workstations. Chemspeed Technologies AG is the leading provider of high-throughput and high-output research & development workflow-solutions from single bench-top / standalone automated workstations (powder dispensing - sample preparation - synthesis - process development - formulation - application - testing) up to complete and integrated product development workflows for the entire product development processes in the chemical, material science, renewables & energy, pharmaceutical, agrochemical, specialty chemical, home care, cosmetics and nutrition industries, as well as academia.



Chemspeed Technologies offers hardware and software for every step in the product development cycle

About Chemspeed Technologies

- Swiss company, located nearby Basel
- 19 years of expertise in speeding up research and innovation in chemical industry and academia
- Pharmaceuticals, Agrochemicals, Fine & Speciality Chemicals, Renewables, Catalysts, Polymers, Nanomaterials, Biomaterials, Lubricants, Paints & Coatings, Personal & Home Care, Nutrition
- Globally operating, global installation base (Asia, Europe, America)
- More than 70% of Chemspeed staff have an academic degree in chemistry or engineering
- Proprietary technology base (reactors, robotic tool exchange, gravimetric dispensing, SMOLE, SMOLEFIN) with unlimited, license-free access for our customers
- Research achievements with Chemspeed tools belong solely to our customers

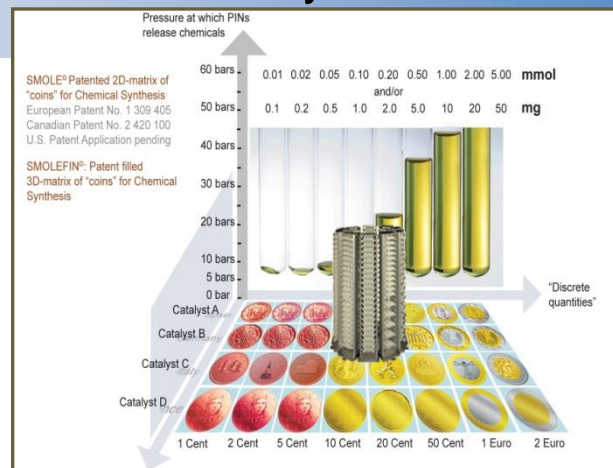


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- Ligand and Donor Synthesis
- Reformatting / Storage
- Screening
- Optimization
- QC
- Competitor Benchmarking
- DoE, Data Management



Globally
Standardized,
Ready-to-Apply
Library

Catalysts from traditional & semi-automated synthesis, production & competitors

Build Library

Apply Library

Traditional & semi-automated catalyst testing, analytics, shipping

Video: [SMOLE](#), [SMOLEFIN](#)

Catalyst Synthesis

Filling

Storage

Polyolefin Screening & Optimization

Integrated Catalyst & Polymer Analytics

SYNTHESIZER AUTOPLANT POSYCAT

SWING SMOLEFIN

SYNTHESIZER AUTOPLANT POSY

WORKFLOW MGT SOFTWARE

THANK YOU

For more details or on site presentation please contact:

Chemspeed Technologies AG

Michael Schneider, Ph. D.

Senior VP, Business Development

Wölferstrasse 8

4414 Füllinsdorf

Switzerland

Phone: +41 (0) 61 816 95 00

Fax: +41 (0) 61 816 95 09

Email: michael.schneider@chemspeed.com

Web site: www.chemspeed.com

