Hydrogenation R&D Solutions: Batch and Continuous Hydrogenation Chemistry
ILS-Hydrogenation R&D Solutions

High-Throughput BATCH Hydrogenation

ILS-Background
ILS-Integrated Lab Solutions GmbH is a well-established leader in the design and construction of highly-customized laboratory reaction testing systems.

ILS offers contract R&D services should you need to realize a rapid expansion of R&D capabilities without investing in additional infrastructure or staff.

High-Throughput Hydrogenations
ILS has developed a novel technology platform, which makes it possible to perform large numbers (up to 96!) of slurry- or homogeneously catalyzed reactions in parallel.

Maximum pressure of 200 Bars with a typical maximum temperature of 200°C. Reactors are independently magnetically stirred.

Air & Moisture-Sensitive Catalysts Can be used-NO INTERTIZATION and NO CLEANING NEEDED!!!

Reactions are performed in septum-sealed glass vials, which the client fills with a separate catalyst synthesis platform in an intert atmosphere. Note that even Raney Nickel-type catalysts can be tested in this system (despite paramagnetism of catalyst).

The unit is outfitted with a series of needles, which puncture the septum-sealed vials containing the catalyst. Inert nitrogen purges any air out of the pressure vessel.
This unique system TOTALLY ELIMNATES THE NEED TO PRE-INERT the reactor saving valuable time and maximizing experimental throughput.

After reaction, the entire reaction mixture is contained within the glass vial meaning that there is NO NEED TO CLEAN THE REACTORS after reaction.

The vials can be simply removed and a new set added for the next reaction. The vials can easily be transported to the necessary offline analytical tools for workup and analysis.

operate than comparable systems on the market and much easier to operate.

Fully-Automated Version

ILS has also made fully-automated versions of this system. The entire hydrogenation can be pre-programmed in the ILS recipe control system and executed with a single mouse-click.

The standard ILS high-throughput screening system is much easier to
Medium-Throughput Process-Optimization Unit

Process-Optimization Unit
Once the most promising catalysts have been pre-selected using the primary-screening, high-throughput reactor from ILS, they can be tested under PRECISE REACTION CONDITIONS in our 4-parallel process optimization reactor system.

4 COMPLETELY INDEPENDENT reactors are used.
- High-pressure catalyst injection
- Independent heating/cooling
- Gas & Liquid dosing with low-flow mini-coriflow technology
- Liquid-gas dosing
- In-Line Solvent Purification
- Fully-Automated

Automated Catalyst Preparation in Inert Glovebox Atmosphere
The reactors are seamlessly integrated together with a catalyst preparation robot mounted inside of a fully-inert glovebox.

Catalysts are synthesized, mixed with electron donors and co-catalysts and then directly injected into the reactors under pressure.

Online torque-measurement is provided. The reactors are easily accessed for cleaning and maintenance.

Fully Automated
The unit is fully automated. All of the catalysts preparation and testing steps are programmed into the ILS recipe control system. This makes fully-automated operation 24/7 operation of the unit possible.
Continuous-Flow Hydrogenations

True Scalability!
ILS is a world leader in designing continuous-flow reaction systems, capable of producing highly-scalable results.

We have made everything from single, large-scale pilot units to 32-parallel high-throughput reactors, capable of screening large numbers of catalysts in very short periods of time.

By performing traditional batch reactions in continuous flow, highly-exothermic reactions can be carried out with much tighter control over the temperature.

The true, plug-flow hydrodynamics of the ILS continuous-flow systems results in the formation of significantly less waste, which often occurs as a result of the presence of undesired series reactions in batch reactors, which are often best considered as ideally-mixed CSTR systems.

Figure 1: Example of a 4-Parallel Continuous-Flow Unit

ILS Testing Services
ILS can perform contract R&D testing services for you if you do not have the necessary in-house infrastructure for doing this.

We have a dynamic, 26-women/men team with over 50% M.S. And PhD Chemists and Chemical engineers who can quickly realize your project in a fraction of the time it takes most companies to do these tests.

Online Videos
Online videos showing our medium-throughput process-optimization unit can be found at the following links:
- www.integratedlabsolutions.com
- https://www.youtube.com/watch?v=21DTCiSG9VQ
- http://vimeo.com/104928266

The parallel continuous flow units can be found at the following links:
- https://www.youtube.com/watch?v=ve9PeX4SgI8
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