freeslate
Metal impregnation

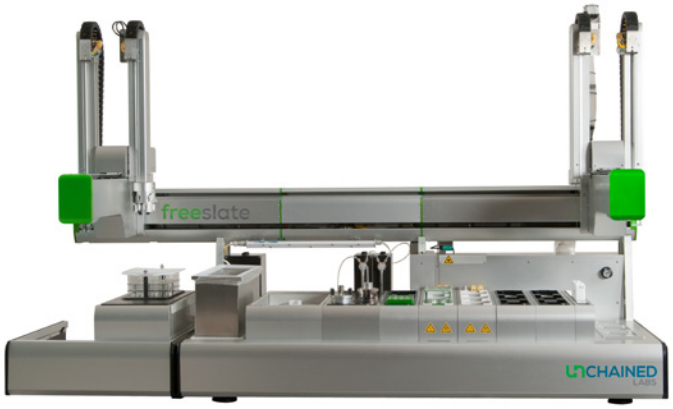
Develop catalysts with unrivaled capabilities. The freeslate system configured for metal impregnation allows you to synthesize hundreds of catalysts per week, produce high quality materials and screen with different reactor options, allowing you to discover and optimize heterogeneous catalysts with unmatched efficiency.

Applications

- Hydroprocessing and other refining catalysts
- Biomass and sugar conversion catalysts
- Hydrogenation catalysts
- Broad range of supports including inorganic oxides and carbons
- Powdered supports, shaped supports and extrudates
- Sol-gel chemistry
- Aqueous and organic solutions

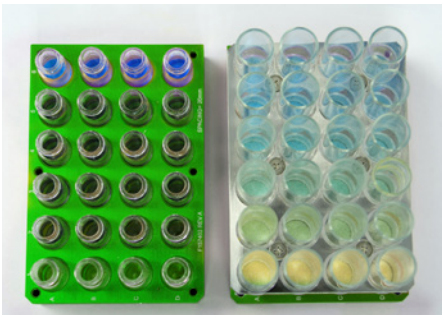
Key features

- Automatically dispense solids and liquids, measure pH and fluidize solid particles, all on one deck
- Easily alter desired scale and percent loading of component through experimental design
- Control every aspect of catalyst production through an array-based template
- Increase the impregnation rate with multi-dispense tips, allowing for multiple experiments to run daily
- Screen results quickly using LEA software

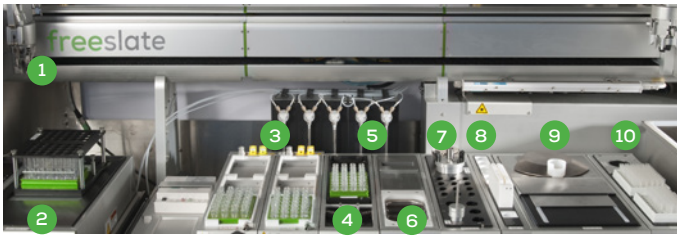


freeslate configured for metal impregnation

Vertical shaker



Metal precursor solutions and finished catalysts



Example freeslate deck configured for metal impregnation

1 Vial/plate gripper
2 Vertical shaker
3 3-position heating/cooling/stirring
4 Capping/decapping station
5 Heated vacuum chuck
6 Ultrasonic wash
7 Powder dispense hopper rack
8 Wash station
9 Balance with integrated camera
10 3-position tip rack

Available options

Vial/plate gripper
Plate size: Standard microtiter
Vial size: 1–125 mL
Total mass: Up to 3 kg

4-tip liquid dispenser – extended tip
Variable fixed tip pitches: 9 mm, 13 mm
Extendible tip: 1
Syringe sizes: 50 µL – 10 mL

pH measurement
Configuration: Single or multi-channel probe
Measurement time per 96-well plate: <90 min
Range: 1–13 pH unit
Resolution: 0.05 pH unit
Repeatability: ±0.1 pH unit

Solid dispenser
Dispense technology: Dispense algorithm dynamically controls the dispensing head to adjust for powders with different densities, particle sizes, particle shapes and static charges

- **Classic powder dispense:** Traditional stirrer dispense mechanism
  - **Hopper volume range:** 10–100 mL
- **Storage vial (SV) powder dispense:** Unique vibratory dispensing mechanism for highly precise dispensing of small amounts as low as 0.5 mg
  - **Hopper volume:** 4 mL

Heating/cooling/stirring station
Temperature range: -20–180 °C
Mixing: Up to 750 rpm
Mixing type: Magnetic tumble stirring

Vertical shaker
Amplitude adjustment: Manual
Frequency: 50/60 Hz (same as AC frequency)
Mass range: 0.5–4 kg

Whisking
Whisk for break-up of aggregates and even distribution of precursor
Maximum speed: 120 rpm

Capping/de-capping station
Vial range: 2–125 mL

Viscous liquid dispense
Technology: Positive Displacement Tip (PDT)
Disposable tips: 10–10,000 µL from Eppendorf and Rainin
Viscosity: 1–1,000 cP

Balance with integrated camera
Maximum weight:
- **Standard:** 1200 g
- **High-sensitivity option:** 220 g

Sensitivity:
- **Standard:** 0.1 mg
- **High sensitivity option:** 0.01 mg

Resolution:
- **Standard:** 0.1 mg
- **High-sensitivity option:**
  - 0.01 mg (0–110 g)
  - 0.1 mg (110–220 g)

Repeatability:
- **Standard:**
  - **High weight (measured >200 g):** 0.25 mg
  - **Low weight (measured up to 200 g):** 0.15 mg
- **High-sensitivity option:**
  - **High weight (measured at 200 g):** 0.15 mg
  - **Low weight (measured at 10 g):** 0.04 mg

Response time: <22 s
Camera resolution: 1032 pixels (max wide) x 779 pixels (tall)

Facilities requirements

Physical:

Without enclosure:
78 cm W x 206 cm D x 140 cm H, ~300 kg

With integrated enclosure:
101.6 cm W x 243 cm D x 220 cm H, ~450 kg

Electrical:

freeslate:
208–220 V ±10%, 50–60 Hz, 20 A

Computer:
US: 115 V ±10%, 60 Hz
EU: 220 V ±10%, 50 Hz

Compressed dry air: 0.5–0.9 MPa (70–130 psi), 4 L/min (8 mm hose)

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