

Creating a Battery Cell

A guide to R&D equipment for
Pilot line set ups





R&D Scale Cylinder / Coin / Pouch Cell Flow Chart

The below listing is a step-by-step guide of how to produce a Li-ion Battery Cell using MTI Corp equipment & materials.
The equipment indicated has various sizes and specifications, therefore can be customised to meet your requirements.

Scan for
MTI R&D
Equipment



Material Synthesis

Sintering: Furnace to sinter raw active material (Cathode & Anode)

Example: **Two Zone Rotary CVD Tube Furnace**



Milling: Ball Mill to unify grain size

Example: **Planetary Ball Mill**



Slurry Mixing

Option 1 (Large Size)

Example: **Tri-Shaft Planetary Vacuum Mixer**



Option 2 (Small Size)

Example: **MTI Compact Vacuum Mixer**



Coating & Drying

Option 1 (Large Size)

Example: **Roll to Roll Coating System**



Option 2 (Small Size)

Example: **Compact Tape Casting Coater**





R&D Scale Cylinder / Coin / Pouch Cell Flow Chart

**Calendering/
Pressing**

Option 1 (Large Size)

Example: Pressure
Controlled Electric
Rolling Machine



Option 2 (Small Size)

Example: Electric Hot
Rolling Press



**CYLINDER CELL
(18650) LINE**



Scan to view
Cylinder Cell
Line Equipment



**COIN CELL
LINE**



Scan to view
Coin Cell Line
Equipment



**POUCH
CELL LINE**



Scan to view
Pouch Cell Line
Equipment

Slitting

Example: Roll to Roll
Edge Slitting Machine



Slitting

Example: Roll to Roll
Edge Slitting Machine





R&D Scale Cylinder / Coin / Pouch Cell Flow Chart

Example: NRTL Certified Vacuum Oven



Drying

Scan to view all Dry Ovens



CYLINDER CELL (18650)

COIN CELL LINE

POUCH CELL LINE

Winding

Example: Manual Winding Machine



Electrode Disc Cutting

Example: Precision Disc Cutter



Pouch Case Forming

Example: Pouch Cell Case/Cup Forming Machine



Tab Ultrasonic Welding

Example: Desk-Top Ultrasonic Metal Welder



Glove Box

Example: Glove Box with Purification System



Electrode Die Cutting

Example: Compact Pneumatic Electrode Die Cutter





R&D Scale Cylinder / Coin / Pouch Cell Flow Chart

CYLINDER CELL (18650)

Deep Welding

Example: **Single Point Pneumatic Welding Machine**



Case Grooving

Example: **Desk-Top Semi-Auto Grooving Machine**



Glove Box

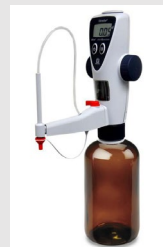
Example: **Glove Box with Purification System**



COIN CELL LINE

Electrolyte Injection (within glove box or dry room)

Example: **Automatic Digital Bottle Dispenser**



Coin Cell Crimping

Example: **Hydraulic Crimper**



POUCH CELL LINE

Tab Ultrasonic Welding

Example: **Desk-Top Ultrasonic Metal Welder**



Electrode Stacking

Example: **Manual Stacking Machine**



Heat Sealing

Example: **Compact Heating Sealer**





R&D Scale Cylinder / Coin / Pouch Cell Flow Chart

CYLINDER CELL (18650)

Electrolyte Injection
(within glove box or dry room)

Example: **Automatic Digital Bottle Dispenser**



Vacuum Standing
(within glove box or dry room)

Example: **Electrolyte Diffusion & Degassing Chamber**



Case Crimping
(within glove box or dry room)

Example: **Hydraulic Crimping Machine**



COIN CELL LINE

POUCH CELL LINE

Glove Box

Example: **Glove Box with Purification System**



Electrolyte Injection
(within glove box or dry room)

Example: **Automatic Digital Bottle Dispenser**



OPTIONAL: Vacuum Standing/Degassing
(within glove box or dry room)

Example: **Electrolyte Diffusion & Degassing Chamber**





R&D Scale Cylinder / Coin / Pouch Cell Flow Chart

CYLINDER CELL (18650)

COIN CELL LINE

POUCH CELL LINE

Example: **Battery Analyzer**



Testing

Scan to view
Testing
Equipment



All consumables & materials are available e.g. Films
& Foils, Tabs, Battery Powders, Li Discs, Cell Cases

Scan to
view all
Chemicals, Materials
& Consumables



Scan to view all
Equipment &
Consumables



**Vacuum Heat Sealing
(Primary Sealing)**

Example: **Compact
Vacuum Sealer**



Formation/Testing

Example: **Battery
Analyzer**



**Vacuum Heat
Sealing
(Final Sealing)**

Example: **Compact
Vacuum Sealer**



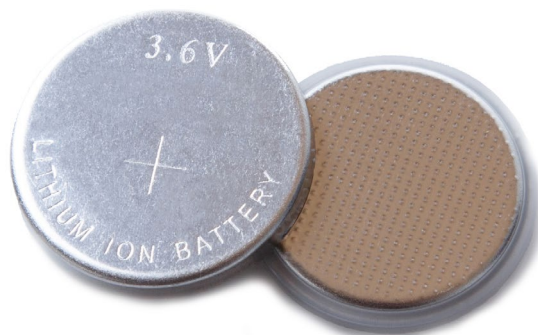


Scan to view
Coin Cell
Preparation
Equipment



How To Create a Coin Cell

**A step-by-step guide of how to produce a
Li-ion Battery Coin Cell
using MTI Corp Equipment & Materials**





Li-ion Coin Cell Fabrication & Equipment Flow Chart

The below listing is a step-by-step guide of how to produce a Li-ion Coin Cell using MTI Corp equipment & materials. The equipment indicated has various sizes and specifications, therefore can be customised to meet your requirements.

Scan to view
Coin Cell
Preparation
Equipment



PROCESS 1: Electrode Sheet Preparation

Step 1: Furnace to sinter raw active material
(Cathode & Anode)

Example: **Two Zone Rotary
CVD Tube Furnace**



Step 2: Milling Machine to mill material
to smaller particles

Example: **High Speed
Vibrating Ball Mill**



Step 4: Coater to coat paste onto current
collector; attach heater to dry

Example: **Compact Tape
Casting Film Coater**



Step 3: Mixer to mix active, conductive and
binder material into paste within vacuum

Example: **Compact Dual-Shaft
Planetary Vacuum Mixer**



Step 5: Rolling Press (Calender) to roll
the electrode to proper thickness

Example: **Hot Rolling
Press**



Step 6: Vacuum Oven to bake the
electrode, removing any moisture

Example: **NRTL Certified
Vacuum Oven**





Li-ion Coin Cell Fabrication & Equipment Flow Chart

PROCESS 2: Cell Assembly

Step 7: Disc Cutter to cut single coated anode, cathode and separator into disc shape

Example: **Precision Disc Cutter**



Step 8: Flatten the discs and then soak them into the electrolyte within the glove box with H_2O and O_2 lower than 1ppm

Example: **Glove Box with Purification System**

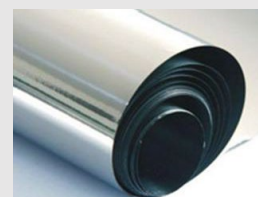


Step 9: Stack the discs by their order within the coin cell case: Cathode + Separator + Anode + Spacer(s) + Spring (current collector from both electrodes to contact the concave side of each case part).

Scan to view all
Chemicals, Materials
& Consumables



Scan to view all
Equipment &
Consumables



Step 10: Electrolyte Filler to fill exact amount of electrolyte into the case

Example: **Automatic Digital Bottle Dispenser**



Step 11: Crimping Machine to crimp the coin cell to seal battery core within case

Example: **Compact & Fast Gas Driven Crimper**





Li-ion Coin Cell Fabrication & Equipment Flow Chart

PROCESS 3: Battery Testing

Step 12: Battery Analyzer to test the coin cell's performance

Example: **Battery Analyzer**



Step 12a (Optional): Battery Resistance Tester to measure battery's internal resistance

Example: **Internal AC Resistance Tester**





Scan to view
Pouch Cell
Preparation
Equipment



How To Create a Pouch Cell

**A step-by-step guide of how to produce a
Li-ion Battery Pouch Cell
using MTI Corp Equipment & Materials**





Li-ion Pouch Cell Fabrication & Equipment Flow Chart

The below listing is a step-by-step guide of how to produce a Li-ion Pouch Cell using MTI Corp equipment & materials.

The equipment indicated has various sizes and specifications, therefore can be customised to meet your requirements.

PROCESS 1: Electrode Sheet Preparation

Step 1: Furnace to sinter raw active material (Cathode & Anode)

MTI UL Standard Split Tube Furnace



Step 2: Milling Machine to mill material to smaller particles

MTI High Speed Vibrating Ball Mill



Step 4: Coater to coat paste onto current collector; attach heater to dry

MTI Compact Tape Casting Coater



Step 3: Mixer to mix active, conductive and binder material into paste within vacuum

MTI Desk-Top Dual-Shaft Planetary Vacuum Mixer



Step 5: Rolling Press (Calendar) to roll the electrode to proper thickness

MTI 110°C Hot Rolling Press



Choose method:

**Stacking
OR
Winding**

All consumables & materials are available e.g. Al Film, Metallic Strip Terminal, Tabs



Scan to view all
Chemicals, Materials
& Consumables



Scan to view all
Equipment &
Consumables





Li-ion Pouch Cell Fabrication & Equipment Flow Chart

PROCESS 2: Cell Assembly

STACKING

Step 6: Electrode Die Machine to cut out electrode with lead

Example: **Compact & Precision Pneumatic Die Cutter**



Step 7: Stacking Machine to stack layers in form of Anode + Separator + Cathode + Separator + etc

Example: **Semi-Auto Stacking Machine**



WINDING

Step 6: Slitting Machine to slit electrode sheet to strip

Example: **Semi-Automatic Slitting Machine**



Step 7: Winding Machine to wind, strips layers in form of Anode + Separator + Cathode + Separator + etc

Example: **Manual Winding Machine**



Step 8: Ultrasonic Welding Machine to first weld current collector and then tab together

Example: **Desk-Top Ultrasonic Metal Welder**



Step 9: Short-circuit Detector to test if the cell has a short-circuit

Example: **Battery Analyzer**



Step 10: Vacuum Oven to dry the cell if no short-circuit

Example: **NRTL Certified Vacuum Oven**



Li-ion Pouch Cell Fabrication & Equipment Flow Chart

PROCESS 3: Case Formation & Sealing

Step 11: Cup Forming Machine to punch cup-shape and gas receiver on Aluminium lamination sheet and then place cell into the cup

Example: **Cup Forming Machine**



Step 12: Top & Side Heat Sealing machine to seal the top and shorter side after double-up

Example: **Heating Sealer**



Step 13: Electrolyte Filling System to fill electrolyte in vacuum/glove box

Electrolyte Filling:
Example: **Automatic Digital Bottletop Dispenser**



Glove Box:
Example: **Glove Box with Purification System**



Step 14 (Optional): De-gas by removing air from the electrolyte

Example: **Electrolyte Diffusion & Degassing Chamber**



Step 15: Vacuum Primary-Sealing Machine to seal longer side (the side with gas receiver) under vacuum after electrolyte is filled

Example: **3-in-1 Compact Hot Sealer**





Li-ion Pouch Cell Fabrication & Equipment Flow Chart

Step 16: Battery Analyzer (Analyzer as per Step 9)

to Charge/Discharge the cell for battery formation and drive the unnecessary gas caused by electrode chemical reaction into gas receiver. (A clamp may be applied on the battery to drive gas)

Example: **Battery Analyzer**



Step 17: Cutting off the gas receiver and Vacuum Sealing Machine for final sealing on the cutting edge under vacuum conditions within glove box (Sealer as per Step 15 & Glove Box as per Step 13)

Example: **3-in-1 Compact Hot Sealer**



PROCESS 4: Battery Testing

Step 19a (Optional): Battery Resistance Tester to measure battery's internal resistance

Example: **Internal AC Resistance Tester**



Step 19: Battery Analyzer to test the coin cell's performance (Analyzer as per Step 9)

Example: **Battery Analyzer**



Step 18 (Optional): Trim pouch cell case to shape

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