



## Company Profile and Products

# Premium Lithium Battery Technology and Products

**PHD Energy Inc.**  
**MaRCTech2 Inc.**



# Our Founders



## Michael (Hui) Xie

- 2009, Ph.D. degree on Lithium-ion battery technology.
- 2009-2012: Worked for Prof Goodenough in UT Austin; Prof Goodenough is well known as the “Father of Lithium-Ion Batteries”.
- 2013 - now: Providing battery solution and products.



# Our Founders

## Harry Mkhitarian

- 25+ years design and manufacturing experience.
- Extensive background in Power supplies and battery pack designs.
- Member of IEEE standards committee that was responsible for developing IEEE 1725 battery safety standard.
- Worked with many global safety certification agencies.
- Broad background in Quality and process control (FMEA, PFMEA, Gauge R&R, reliability ... ).
- Lived 10 years in China working with local manufacturing partner.



# Our Value Proposition

## Products

- Five-manufacturing factories in China
  - A wide range of premium quality battery products
  - Specifically focused on US and EU markets, where **quality and safety** are the most important focuses
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## Service

- Engineer and sales service network in US and Europe
  - Design, quality and project management teams in China
  - We provide the best service and technical support to our customers
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## Technology

- Combined academic, industrial and application knowledge and experience
- Focus on providing the state-of-the-art battery technology to guarantee the best solutions for all of our designs



# Target Markets

## Consumer Electronics

- Sports & Fitness
- Bluetooth & Wireless
- IoT and tracking



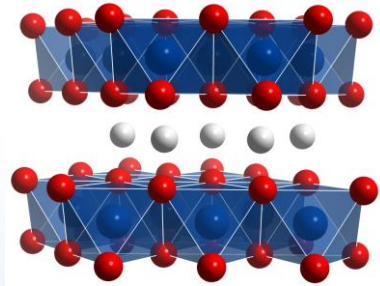
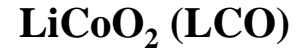
## Medical Devices and Equipment

- Commercial
- Industrial
- Transportation



# Lithium Ion Battery: Chemistry

## Lithium Cobalt Oxide



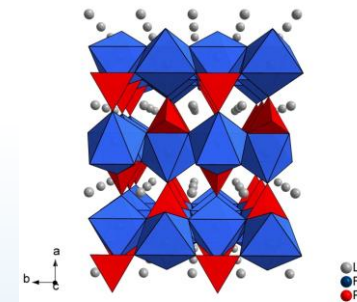
## $\text{Li}(\text{NiMnCo})\text{O}_2$



- Most mature
- Highest energy density
- **Higher cost**
- **Inferior safety**
- Good for small form factor (Li-po) batteries

- Gaining maturity
- Better power rating and safety
- Lower cost
- **Slightly inferior in energy density**
- Good for 18650 and large form factor batteries

## Lithium Iron Phosphate

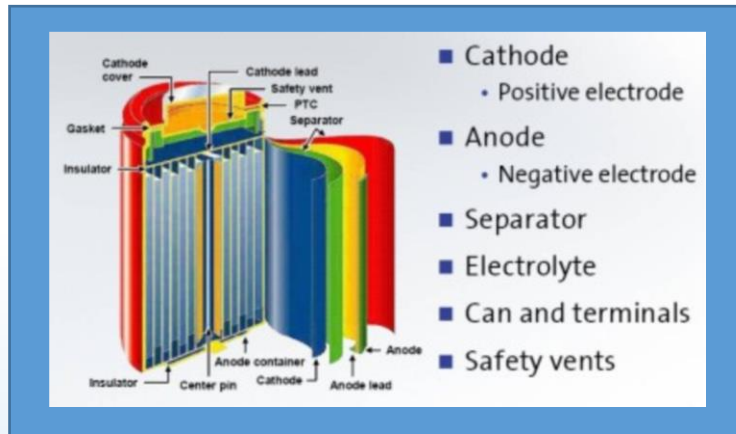


- Best safety
- Longest cycle and service life (2500+ cycles and 5+ years)
- **Lower voltage (3.2V vs 3.6V+) and energy density**
- Good for special applications
- Available in multiple form factors



# PHD Lithium-Ion Battery Products: Category

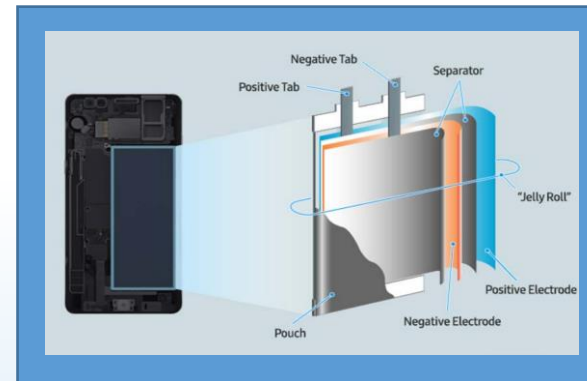
## Li-ion Battery



- Standardized models
- Much lower cost per Amp Hour
- Much better cell-to-cell and batch-to-batch consistency
- **Limited options and fixed sizes**
- **Heavier in weight**

## Li-ion Polymer Battery

(or Li-po battery, pouch cell)



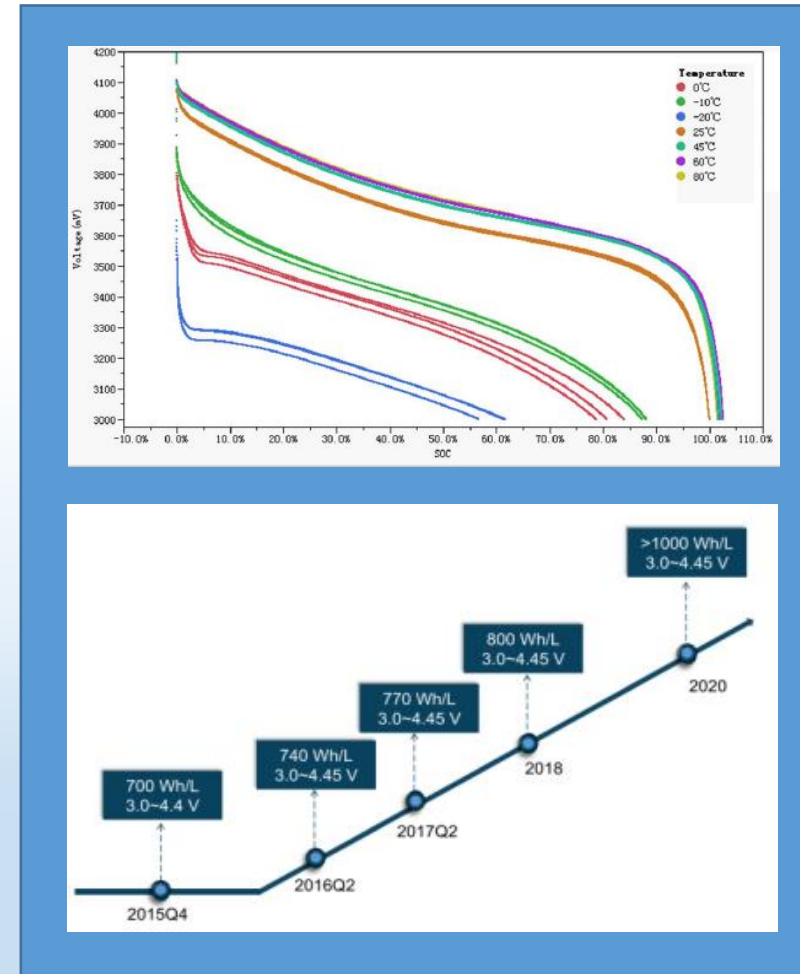
- Flexible shapes and sizes
- Better safety features
- More customizable chemistries and formulas
- **Higher cost per Amp Hour**
- **Inferior consistency**



# Li-ion Polymer Battery-Premium Technology

Our state-of-the-art chemistry and production technologies enable us to produce high quality batteries with premium performance.

- **Wide temperature range:**  
From -30 to 85 °C
- **High energy density**  
4.40V chemistry with >700 Wh/L
- **High charge and discharge rate**  
As fast of 4C in charge and 60C in discharge
- **Long cycle life**  
1000+ cycles for 3.6 - 3.85V chemistry  
2500+ cycles for 3.2V LFP chemistry





# Li-ion Polymer Battery-Manufacturing Capability

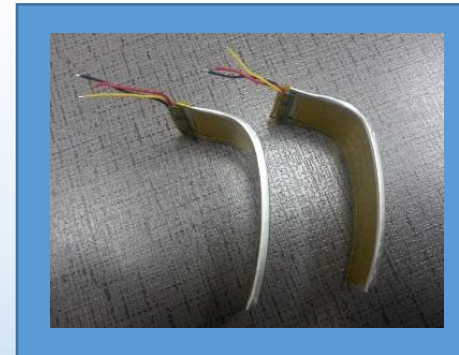
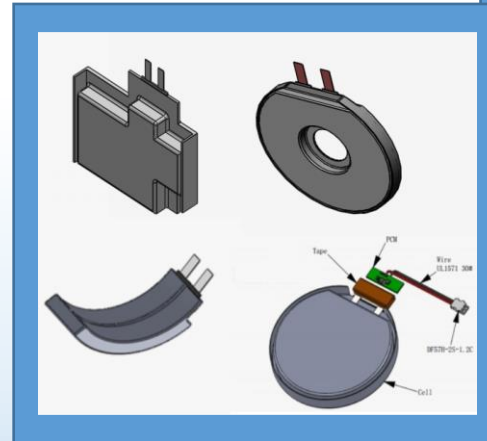
- Advanced production lines produce premium quality for US and EU markets
- 3000+ existing models from a few mAh-Ah
- 500+ models with UL1642, IEC certifications
- Technically proficient, experienced engineering and R&D teams



# Li-ion Polymer Battery-Shaped

**Our patented manufacturing technology offers a wide range of Li-po batteries in various shapes:**

- Ultrathin: 0.5mm thickness for both rechargeable and non-rechargeable
- Cylindrical: 5mm in diameter
- As slim as 7mm in width
- Round shape
- Curved
- Coin cell

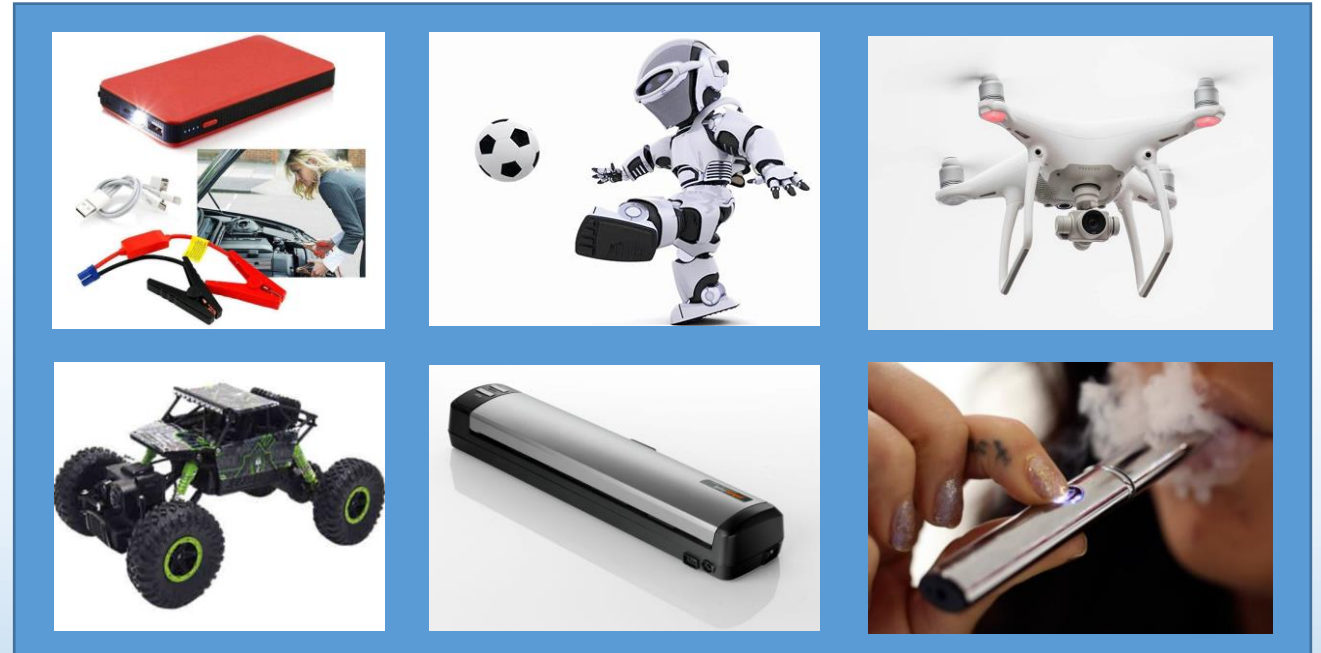


# Li-ion Polymer Battery-High Power

## Key features and advantages:

- Premium technology to achieve as high as **60C** continuous and **120C** pulse rate performance
- Good for both NMC (3.7V) and LFP (3.2V) chemistry
- Wide capacity range from 100 mAh to 10+ Ah with high energy density
- Wide working temperature range
- Advanced process controls deliver reliable, high-quality

## Applications:



# Li-ion Battery-Cylindrical

## Key features and advantages:

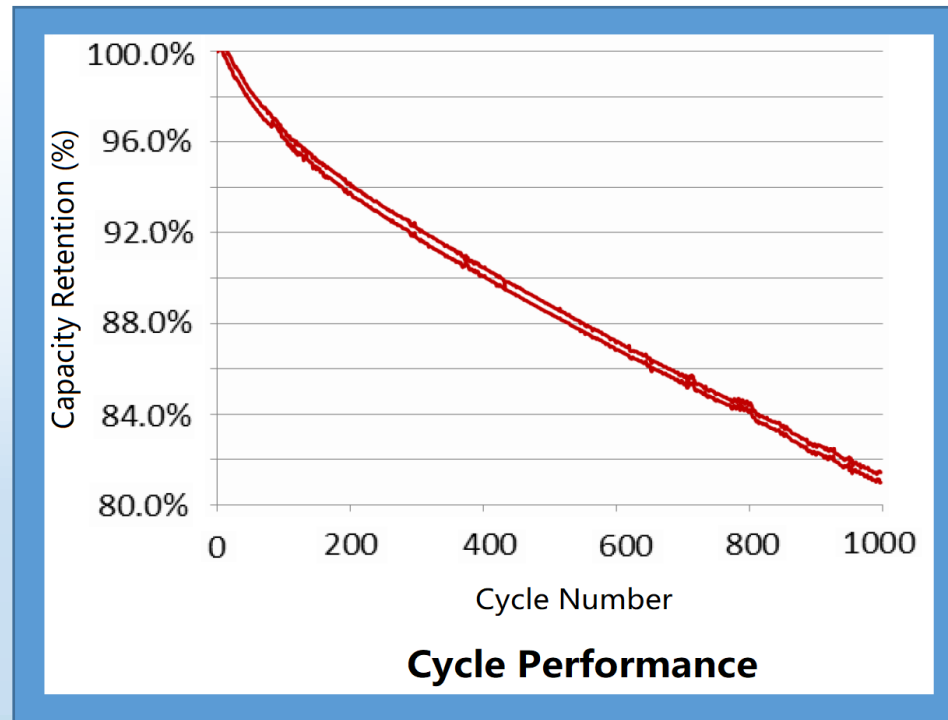
- Automatic production line with high precision, consistency and quality
- A wide range of chemistry and form factors
  - LFP, NMC and LTO
  - 14500, 16500, 18650, 26650, 21700, etc
- For both high power and high energy applications



# Cylindrical Li-ion Battery-NMC 3.6V

## Featured Product: 3350 mAh EV grade 18650-32EG

- Super high energy density with 3350 mAh
- Excellent cell-to-cell consistency, good for EV level applications
- Premium quality with long cycle life
- Low cost per Ah



## Certification Service:

We handle worldwide safety, transportation and environmental certifications and approvals.

- UN38.3 and MSDS
- REACH
- RoHS
- WEEE
- CE
- IEC62133 and CB
- UL1642 cell
- UL2054 pack
- IEEE1725
- Etc.



# PHD and Re-Teck: Total RSCM and Recycling Solutions for your Business

## **Re-Teck:**

- has provided RSCM and recycling services for over 22-years
- runs facilities in Milpitas, CA and Dallas, TX
- is currently constructing a battery recycling facility in Grand Prairie, Texas

## **The Battery Facility:**

- will produce dry, black mass rich in cobalt, nickel, lithium and other materials
- chemicals, heat and water are not used in processing the black mass
- will transport the black mass to vetted refiners for material recovery

## **Re-Teck's Process is Unique:**

- oxygen-free shredding allows batteries with embedded energy to be shred without thermal risk
- separation using negative pressure, magnets and eddy current remove plastics, papers and metals
- electrolytes are captured and solidified
- the process allows for the processing of whole, in-tact small devices without battery separation

The facility, processing and downstream vendor management was designed to provide closed-loop recycling. Li-ion, Lithium Cobalt and other battery chemistries will be processed - none of the resulting material fractions will be landfilled.



# Post Industrial Solutions

- **Service for distribution centers, manufacturing hubs, repair centers, offices and headquarters**
  - Not limited to battery-containing devices
  - Experienced worldwide ITAD service provider
  - On-site, secure collection canisters available
- **Excess and obsolete, manufacturing scrap, pieces, whole units**
  - Worldwide offices and facilities
- **Secure, witnessed destruction for IP-laden devices**
  - Third-party or company personnel
  - View Re-Teck's process throughout their chain-of-custody
  - Remote viewing available
- **Reverse supply chain experts**
  - 22+ -years of experience
- **Customized reporting**





# Post Consumer Solutions

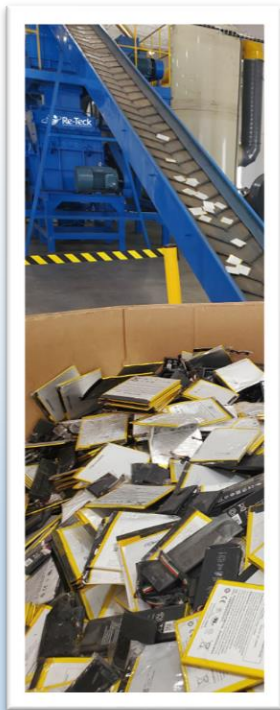
## Re-Teck Provides Turnkey Solutions

- **Proprietary, customized on-line mail back solution**
  - On-site collections
- **Scalable, branded and accessed through your website**
- **Currently providing services to major electronics OEMs**
  - Trade-in programs
  - Recycling programs
- **Easy-to-use, minimal clicks**
  - Produces a mailing label
  - Currently utilizes major logistics providers
  - Returns customers to your website
  - Provides an excellent customer experience
- **Customized reporting**
- **Assist in meeting state Extended Producer Responsibility goals and reporting**



# Re-Teck – Lion Battery Black Mass Processing Grand Prairie, TX.

“We can process your Lithium-Ion Batteries to Black Mass Material for Re-use”  
Below is the latest addition to Re-Teck’s service offering  
Facility planned to be fully operational in June 2022



# Thank you!

We will do our best and provide you with one-stop battery manufacturing, logistics, certification and customized recycling solutions. Let us help solve your greatest challenges!

Any questions, please feel free to contact us.

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