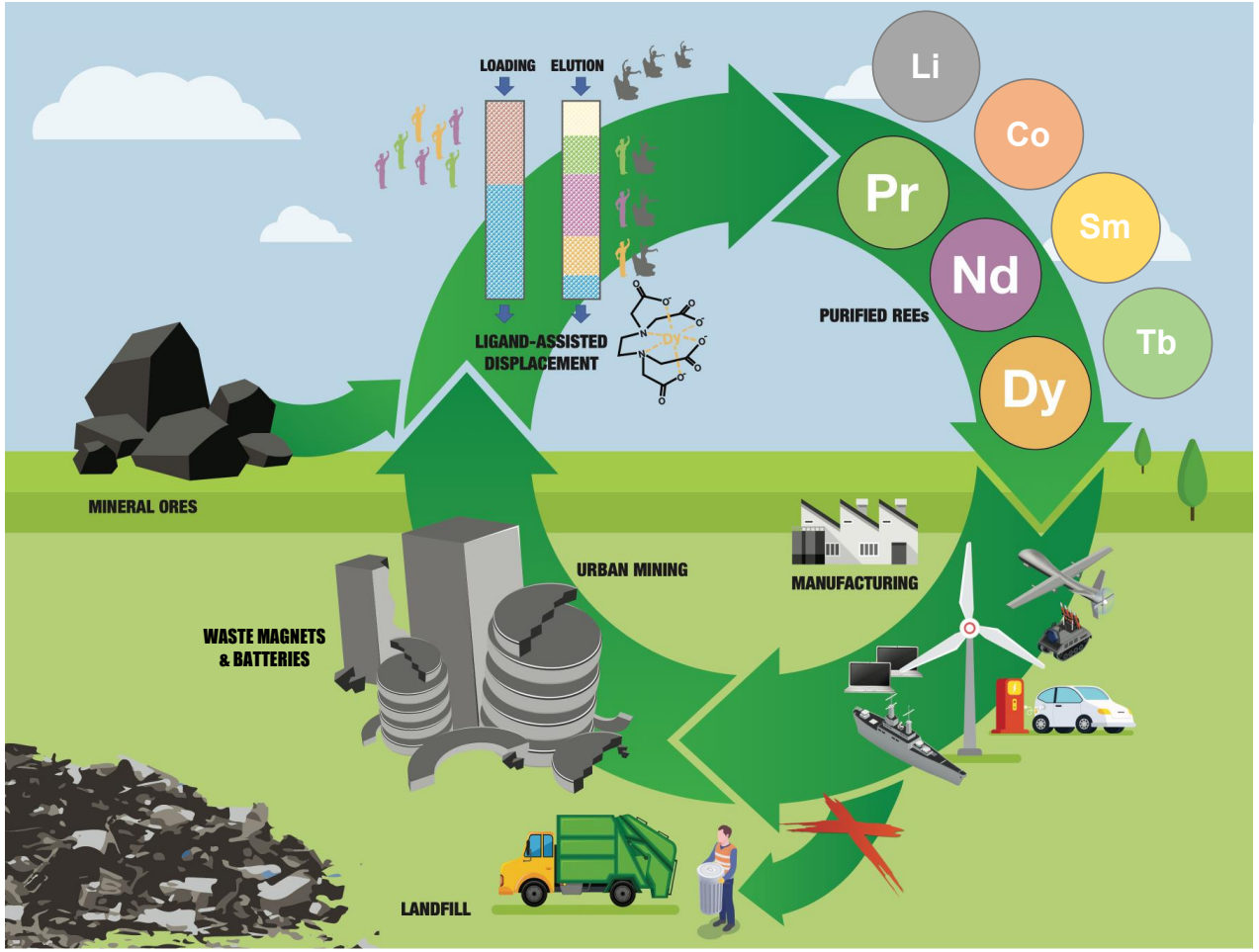
reELEMENT

Creating an Efficient Rare Earth Element Circular Life Cycle

99%+ Purity (Dysprosium · Neodymium · Praseodymium · Lithium · Cobalt · Nickel)

Creating the Most Environmentally-Conscious, Circular Economy for High-Value, End-of-Life Products

- Over $3 billion worth of critical and REEs are landfilled or wasted from end-of-life products annually.
- With the rapid growth of the electrification movement, the addressable market of REEs from end-of-life waste products is expected to increase precipitously.
- Our technology suite provides a real solution to the recycling market as we can economically reprocess materials that once had no alternative but to be disposed of, some of which is costly and prohibitive to discharge.
- Our technology suite enables us to isolate, purify and recycle critical and REEs in the most environmentally safe methods ever developed.



Partnerships that Matter

PURDUE UNIVERSITY	Davidson School of Chemical Engineering / Purdue Research Foundation - Science & Technology Expertise, Sponsored Research Partnership
TEXAS TECH UNIVERSITY	Edward E. Whitacre Jr. College of Engineering - Science & Technology Expertise, Sponsored Research Partnership
CMID consulting management inspection design ENGINEERS | ARCHITECTS | LAND SURVEYORS — Former executives at Lilly	Engineering, Design, Operational Expertise – Critical & REE Chromatography Isolation and Purification Facilities
The Heritage Group	The Heritage Group / HG Ventures – Upstream & Downstream partnership development, feedstock aggregation, materials science, environmental services
Institutionally Owned Wind Farms	Feedstock suppliers of end-of-life wind turbines / rare earth permanent magnets

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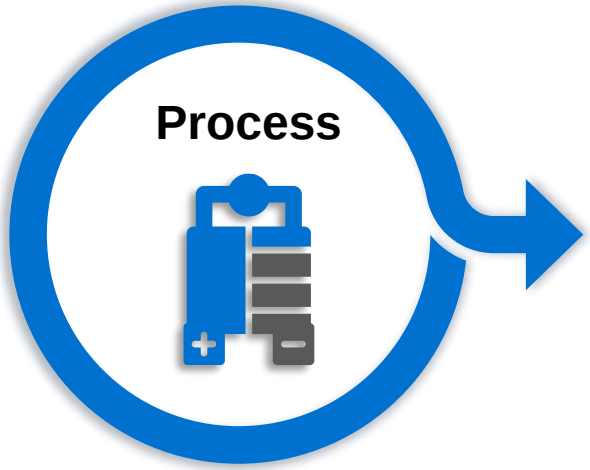
Process

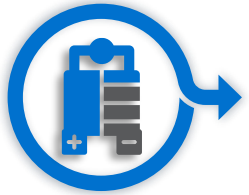
Electrolysis produces monetizable products in the process

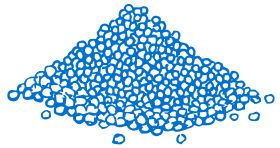


Profitable	$ $ $
Environmental Impact (Positive)	+

Electrolysis Based Technology to Concentrate REE

Feedstock carbon wastes, acid mine drainage and magnets

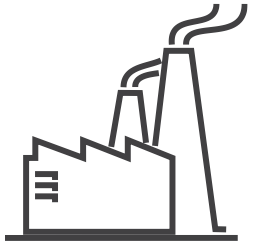




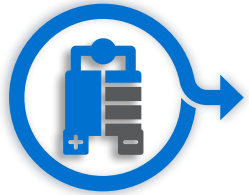
Processed Rare Earth and Critical Elements Concentrate

Byproduct Economics:

Our source materials are excellent feedstock for hydrogen and graphene slurry production creating monetizable Byproducts



Recycling fly ash from coal-based utilities while cleaning up legacy environmental liabilities



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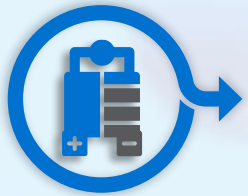
- Rare Earth Elements
- Purified Carbon
- Concrete-Grade Fly Ash
- Hydrogen

Process

Byproduct economics from carbon slurry and acid mine drainage

The value of the electrolysis concentration process compared to other methods.



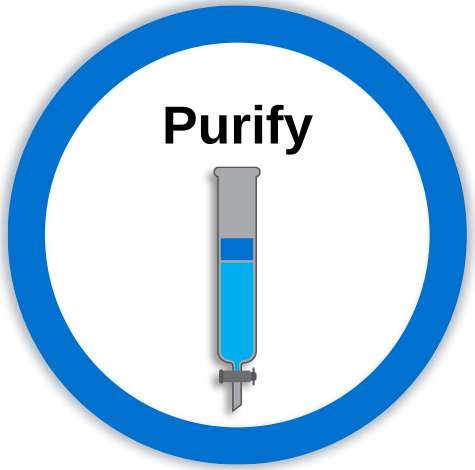
Electro chemistry as a concentration method reduces the steps required to produce high value concentrates of elements and minerals versus traditional methods.

Acid mine drainage and carbon slurries that leach rare earth and battery metals typically contain low PH water combined with high levels of Iron and carbon which enables an increased rate of hydrogen production compared to traditional water-based electrolysis.

Through the process we are focused on monetizing:

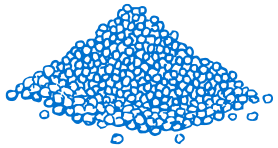
- the carbon production,
- the hydrogen production,
- The graphene slurry, and
- the rare earth and battery metals concentrate.

Purify

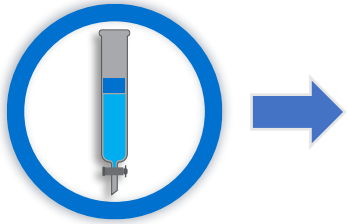


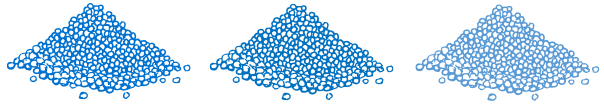
Cost (Low/Medium)	=
Environmental Impact (Neutral)	= / +

The Most Environmentally-Safe Method for Creating Isolated & Pure Highly-Valuable REE



Concentrated REE





Purified REE Separated into Individual Elements

Ligand Assisted Displacement (LAD) Chromatography

Key Highlights:

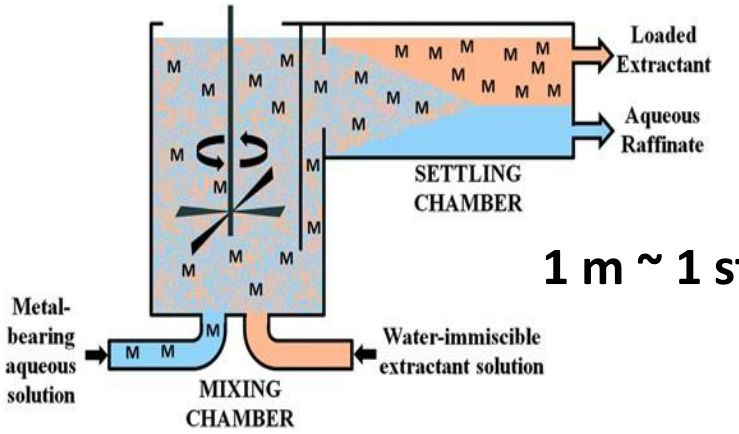
Pure REE are more valuable than concentrate

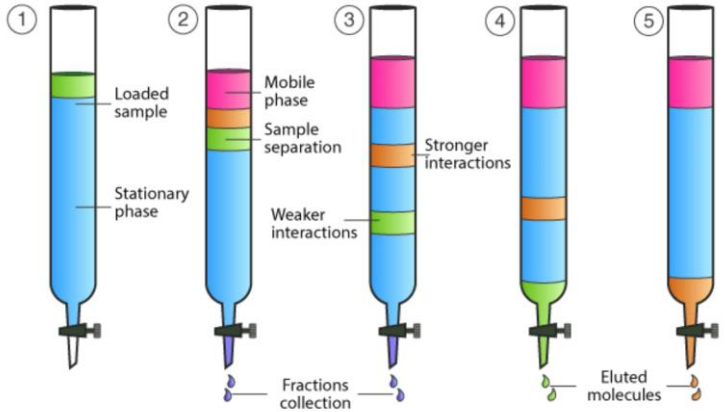
Exclusive Technology to recycle permanent magnets and batteries

LAD Chromatography Separation

A Much More Efficient & Safer Process to Isolate and Purify Critical and REEs

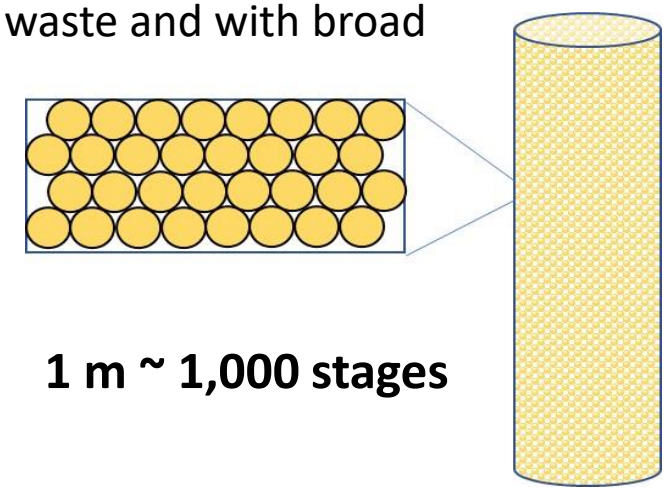
Current Method: Solvent Extraction requires > 1,000 mixer settlers with a large amount of waste discharged creating some of the most polluted sites in the world.





LAD Chromatography Separation's order of magnitude has a much higher interfacial area utilizing low-cost sorbents in a closed-loop, column-based system with little or no waste and with broad selectivity for critical & REEs.

1 m ~ 1 stage → **1 m ~ 1,000 stages**



Advantages to LAD Chromatography

	Solvent Extraction	ARE Chromatography	Advantages
Safety	• Flammable solvents • Toxic extractants • Harsh chemicals	• Aqueous solution • Dilute acid & base	Safer
Chemical cost	1	**<0.5**	Lower
Purity, Yield	99.5%, 88-90%	>99.5%, 99%	Higher
Productivity	1	10-100	Higher
Footprint	10-100	1	Smaller footprint
Start-up time	Months	Days	Shorter
Feedstocks and products	Specific	**Flexible**	More versatile
Separators	>1,000	5	Fewer
Initial investment	5	**1**	Lower
Waste	Acidic wastewater	**Almost zero waste**	Cleaner

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Institutionally Owned Wind Farms, Metal Recyclers – End of Life Products

- Currently supplied from two Indiana based wind farms.
- Expanded relationships to source end of life magnets, swarf and lithium-ion batteries / black mass.
  - Securing early feedstock for first rare earth magnet purification production line
  - Securing early feedstock for first battery metals purification production line

Expired rare earth permanent magnets from wind turbines

Our IP – Synthesizing the Best and Brightest to Create Real Solutions

Patent No. / Agreement	Partner / Assignee	Description
9,199,867 PCT/US2010/031033	Ohio University	Electrolysis: Carbon-Based Electrolysis, Production of Hydrogen, Liquid Fuels and Carbon Nanotubes Simultaneous Removal of Metals, Ammonia and Urea from Water Methods for the Synthesis of Graphene from Coal, Carbon Chars and Carbon Solid Resources Roll-to-Roll Transfer of Graphene and Substrate Recovery
8,029,759 8,409,305 PCT/US2010/027922	Ohio University	Pretreatment Method for Synthesis of Carbon Nanotubes and Carbon Nanostructures from Coal and Carbon Chars
10,544,503 PCT/US2013/035627	Ohio University	Method of Producing Graphene
Sponsored Research	Texas Tech University	Commercialized development and refinement of electrolysis process for our specific feedstocks
10,597,751 PCT/US2015/040975 2955608 - 2015289483	Purdue University	Ligand Assisted Displacement (LAD) Chromatography for High Purity Metal Ion Separation
16/193,566	Purdue University	Preparation of Rare Earth Metals and Other Chemicals from Industrial Coal-Based Waste and Byproducts
62/578,434 PCT/US2018/057712 3080517 - 2018354377 18871054.5	Purdue University	Methods for Designing an Efficient Preparative Chromatographic Separation Process
62/982,811	Purdue University	Multi-Zone LAD Chromatography for the Purification of Complex REE Mixtures
62/982,807	Purdue University	Two-zone LAD Chromatography Method for the Purification of REEs from Waste Magnets
Sponsored Research	Purdue University	Commercialized development and refinement of LAD Chromatography for our specific feedstocks
Sponsored Research	Penn State University	Pyrite Segregation and Recovery of Rare Earth Elements from Coal-Based Waste Streams

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Our Team

Mark Jensen
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American Resources Corporation

Kirk Taylor
CFO
American Resources Corporation

Tarlis Thompson
COO
American Resources Corporation

Thomas Sauve
President
American Resources Corporation

Mark LaVerghetta
VP Corp Fin & Comms
American Resources Corporation

Greg Jensen
General Counsel
American Resources Corporation

Jeff Peterson
Vice President
*re*ELEMENT Technologies

William Smith III
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VP Global Engineering & Manufacturing Services

Daniel Hasler
Advisor - Former Indiana Commerce Secretary - Purdue Research Foundation 31 years at Eli Lilly & Co.

N.-H. Linda Wang, Ph.D.
Maxine Spencer Nichols Professor, Purdue University, Davidson School of Chemical Engineering

David Sauve
Vice President
*re*ELEMENT Technologies

Gerardine Botte, Ph.D.
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Yi Ding
Postdoctoral Research Associate Purdue University
Recovery of Critical & REEs from Complex Mixtures

Christian Alvarez-Pugliese, Ph.D. Electrolysis Project Manager American Resources Corp / CETI Lab – Texas Tech Univ.

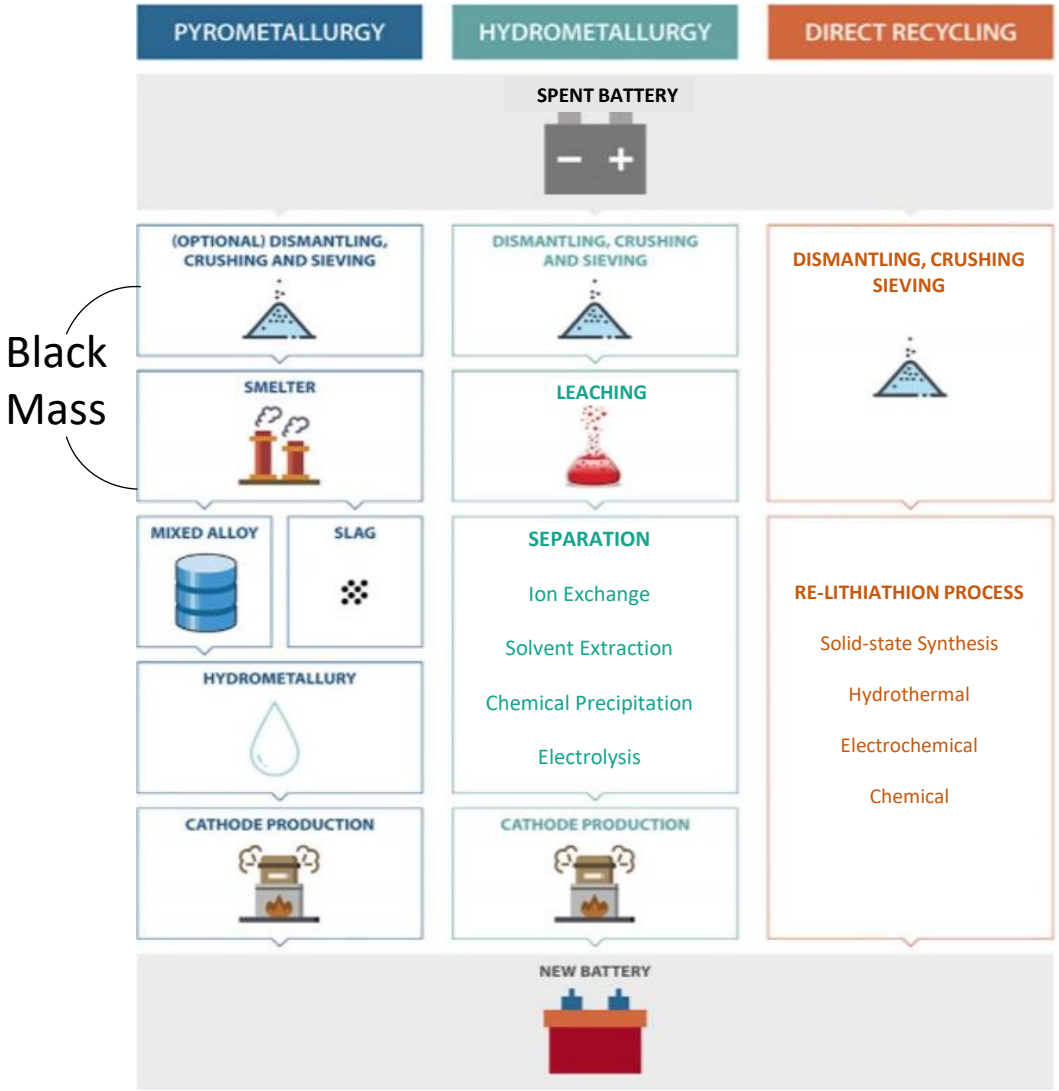
Che-yu Chou
PhD student, Purdue University
Recovery of Critical & REEs from Waste Magnets

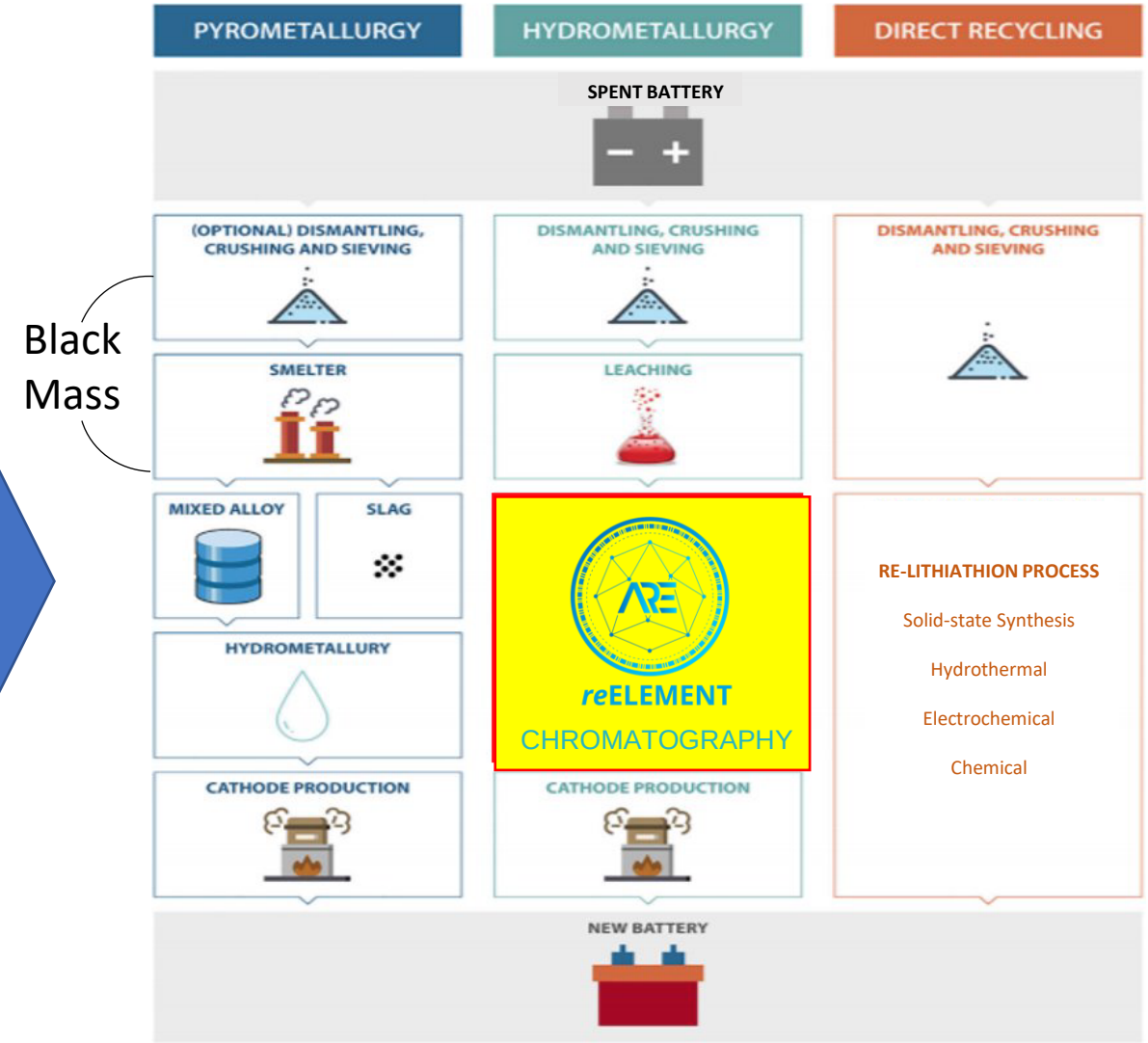
Gabriel Perez Schuster
PhD Student,
Purdue University *Recovery of Critical & REEs from Waste Batteries*

Chih-Yao (Eddie) Tsao
PhD Student
Purdue University *Recovery of Critical & REEs from Coal-based feedstocks*

Battery Metal Recycling Solution

A Complementary and More Efficient Process to Existing Methods and Able to Recover All Metals While Ensuring Quality and Environmentally Safety.

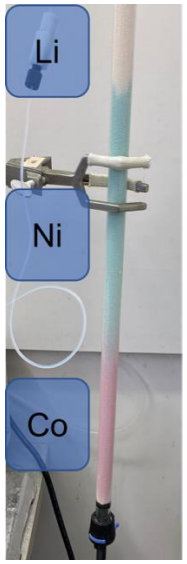


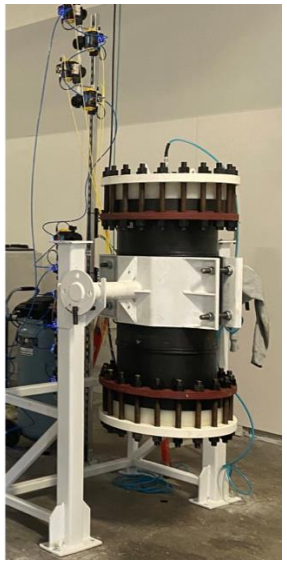


Success in Battery Metal Isolation & Purification

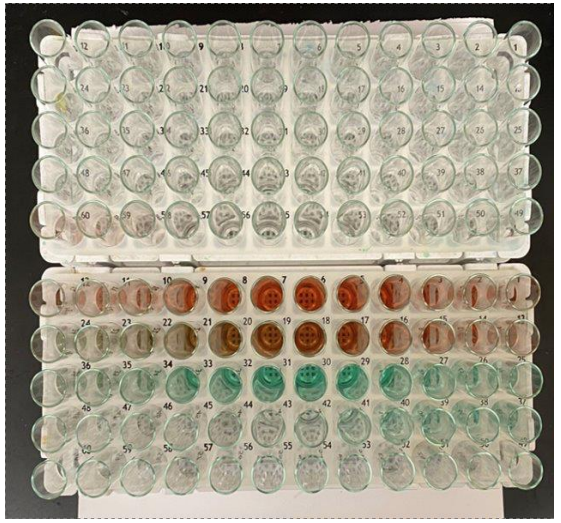
Isolation and Purification of Battery Metals to > 99.5% Purity from End-of-Life Lithium-Ion Batteries from EVs

Single EnerDel Waste Lithium-Ion Battery from EV





Chromatography Separation

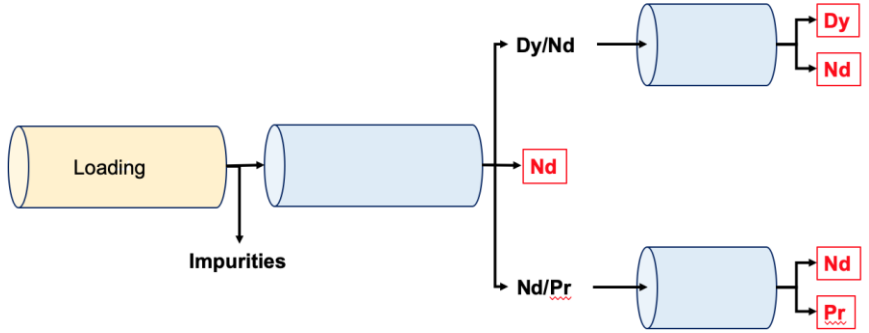


Isolated and Purified Battery Metals

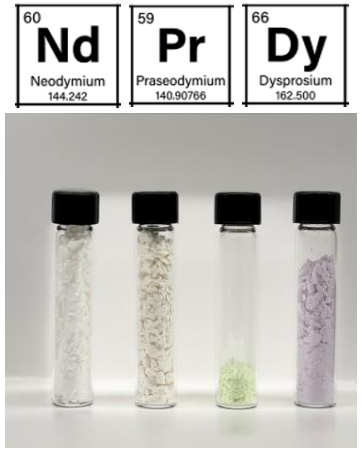
Success in Magnet Metal Isolation & Purification

Isolation and Purification of Rare Earth Magnet Metals to > 99.5% Purity and 99% Yield from End-of-Life Permanent Magnets from Wind Turbines and EVs

End-of-Life Permanent Magnets



Two-Zone LAD Chromatography



Isolated and Purified Magnet Metals

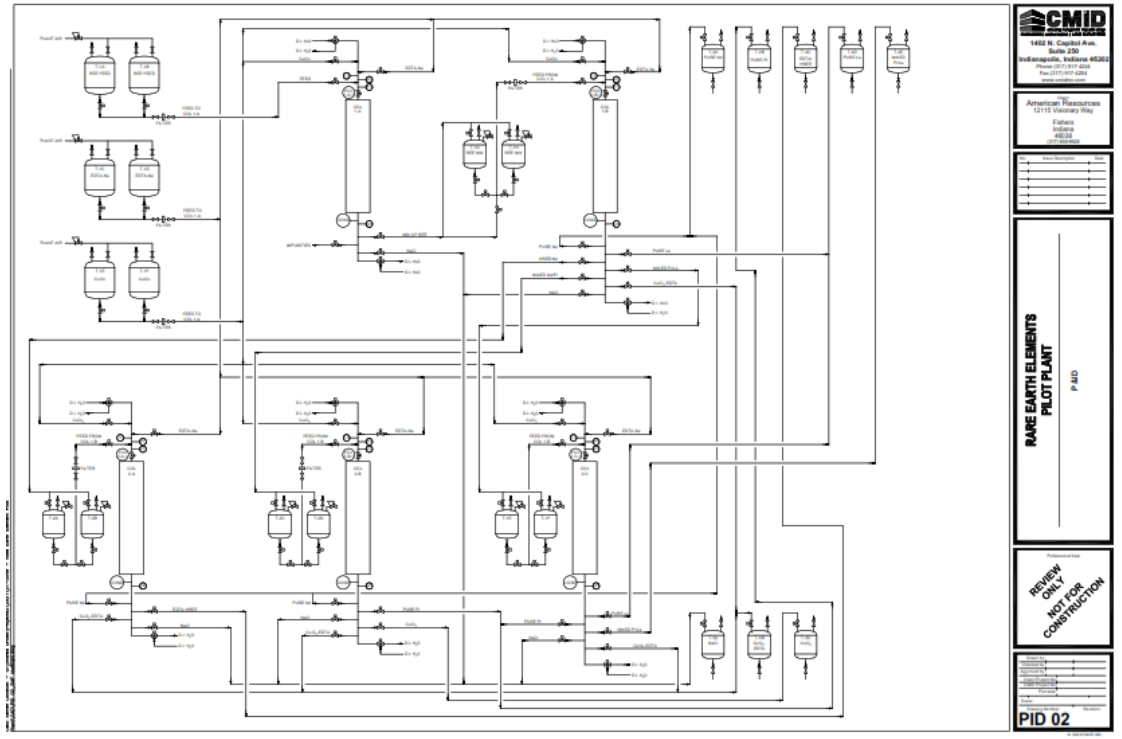
Scalable – Our Facility

Our current facility in the final stages of completion is capable of generating north of $5 million of revenues producing 56,000 kgs of 99%+ purity of sellable rare earth and critical elements.

We are currently in the design and build phase of our full-scale commercial facility to isolate and purify rare earth and critical elements (permanent magnet and battery metals) capable of producing over 3.0 million kgs of rare earth and critical elements.

We are currently in the permitting phase of our selected 7.5 acre site located in southern Noblesville, IN

Current Production Train Schematics



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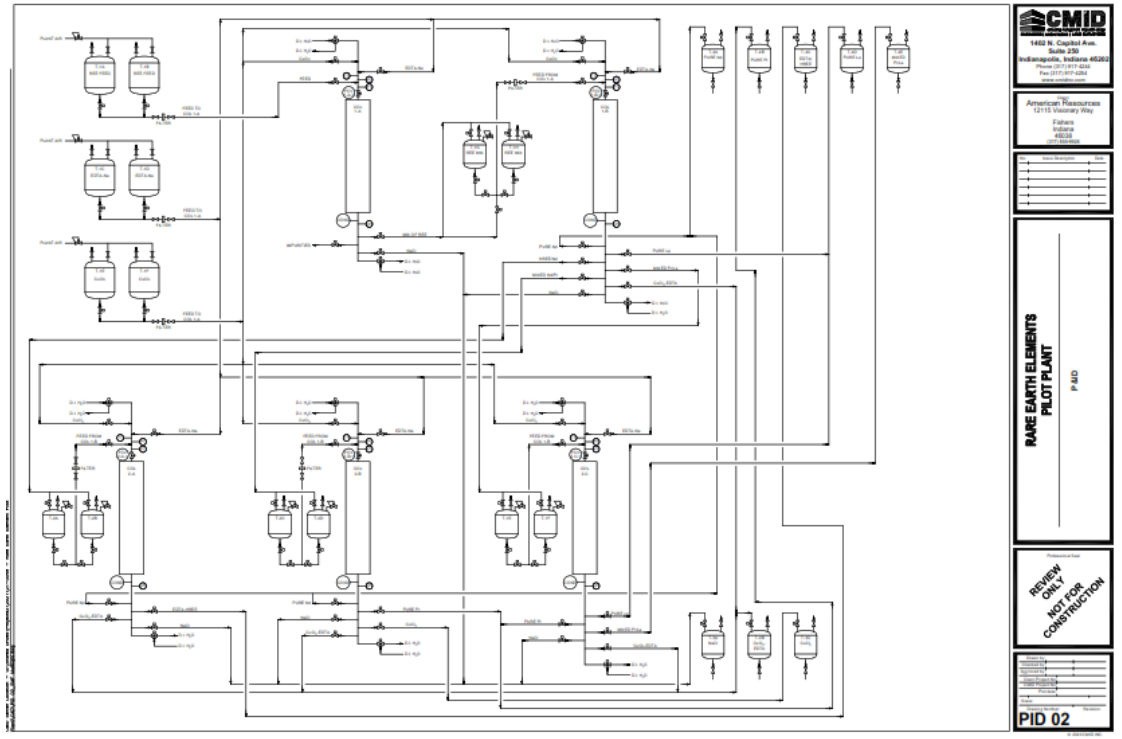
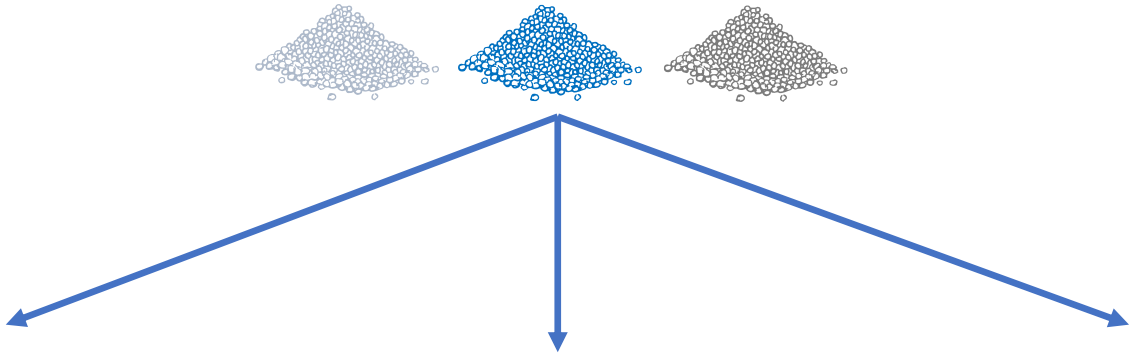
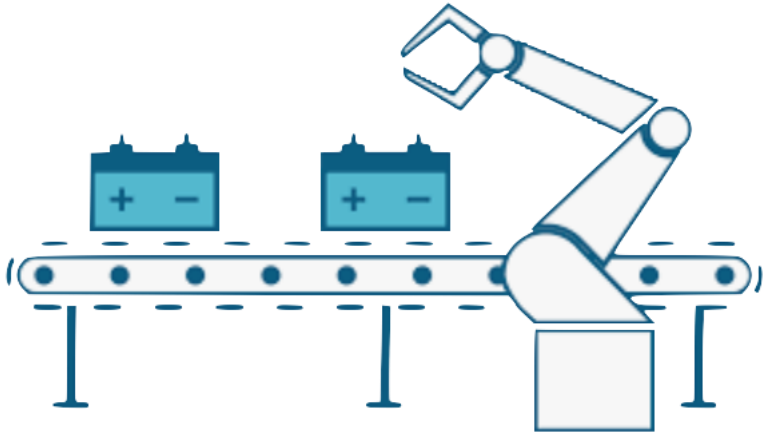


Isolation and Purification Facility Buildout

The first commercial scale rare earth and battery metals recycling facility will be commissioned in June of 2022, scaling to a ½ ton a day of isolated and purified battery and rare earth elements in Noblesville Indiana.

Downstream Consumers of Purified Metals





Battery Manufacturers

EV Powertrain Manufacturers

Permanent Magnet Manufacturers

Rare Earth and Battery Metal Product Mix

In 2022 the Company will have the following products available for sale.

Element	Form	Purity
Neodymium (Nd)	Defined by Customer	99.5% to 99.99%
Praseodymium (Pr)	Defined by Customer	99.5% to 99.99%
Nd / Pr Mixed Oxide	Defined by Customer	99.5% to 99.99%
Dysprosium (Dy)	Defined by Customer	99.5% to 99.99%
Cobalt (Co)	Defined by Customer	99.5% to 99.99%
Lithium (Li)	Defined by Customer	99.5% to 99.99%
Nickel (Ni)	Defined by Customer	99.5% to 99.99%
Manganese (Mn)	Defined by Customer	99.5% to 99.99%
Co/Li/Ni/Mn Mixed Solution	Defined by Customer	99.5% to 99.99%
Co/Li/Ni/Mn Mixed Solution	Defined by Customer	99.5% to 99.99%

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