

# (CMI Critical Materials Institute

# An Energy Innovation Hub

#### Focus Area 3: Improving Reuse and Recycling

Enhance efficient reuse and recycling of highly diverse set of materials to further diversify global supply chain of critical materials by:

- Enhancing recycling techniques
- Improving product design
- Understanding recycling techno-economics
  Using the thermodynamics of separations.



#### Purpose

- Low reuse and recycling due primarily to poor economics and lack of methods with high enough yield or low enough cost
- Sources and matrices of recyclable materials are highly diverse
- To prevent loss to garbage dumps and the environment.

# Major Challenge

• Diversity of sources plus policy drive the technology adoption plus process economics.

## **Opportunities**

• With industry's engagement, opportunities exist in the areas of fluorescent lamps, general electronics, magnets, & urban mines.



### Strategy

- Develop economically viable and environmentally acceptable processing methods that apply to more than one material stream and reduce challenge of processing diverse source materials.
- Examine materials loss in manufacturing processes
- End-of-life disposition for consumer and commercial products
- "Re-mine" and make available this secondary supply in economically feasible, energy efficient and environmentally appropriate ways
- Recover additional high-value materials (e.g.,

precious metals) that provide opportunities for improved process economics, policy and adoption/utilization





