KEMETCO RESEARCH INC

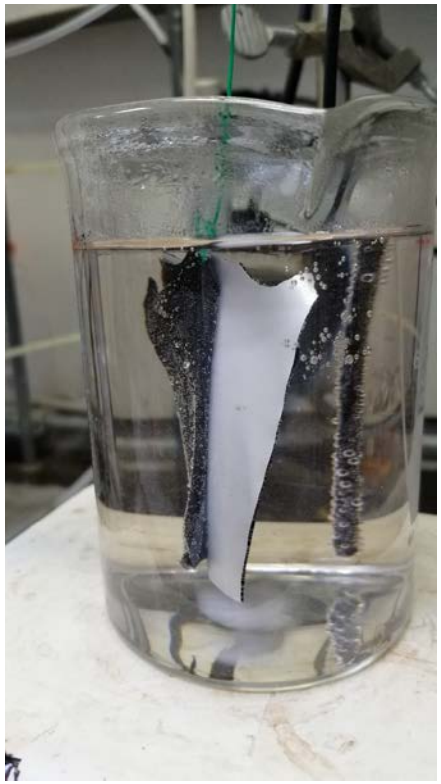
CONTRACT RESEARCH & TECHNOLOGY COMMERICALIZATION

Lithium-Ion Battery Cathode Scraps Recycling

August 2018

As-Received Material

Developed New Pre-Treatment to Separate Active Material from Al Foil



Pre-Treatment of Cathode Trimmings

After Pre-Treatment to Separate Active Material from Al Foil

Developed Mineral Processing Technique to Separate Majority of Activate Material

Developed Mineral Processing Technique to Separate Majority of Al Foil

Extraction of Active Cathode Metals

Extracted Solutions Containing Ni, Co, Mn and Li

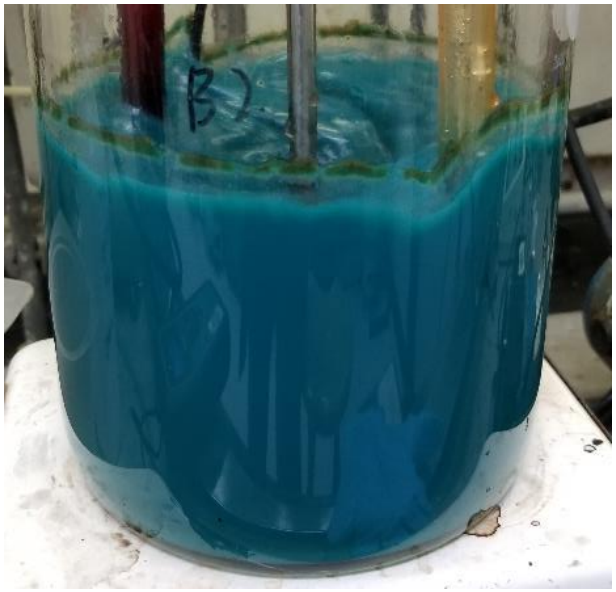
Residue From Extracted Cathodes
(Contains Mainly Polymer Separator and Trace Al)

Purification to Remove Dissolved Al


Removing Dissolved Al


Al Precipitate After Purification

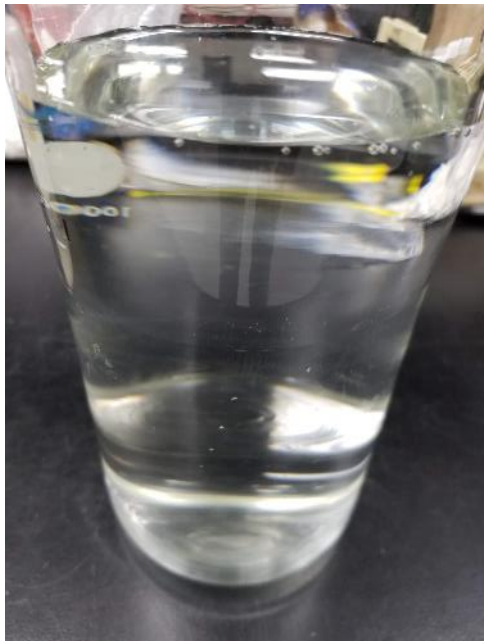
Precipitation of Ni, Mn, Co Hydroxide



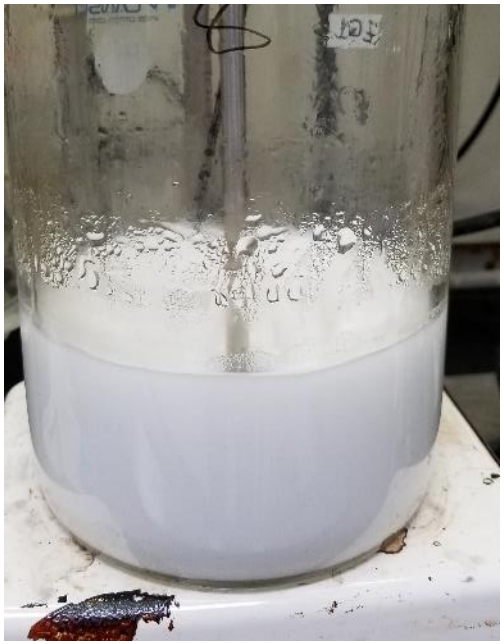
Precipitation of Ni, Mn, Co Hydroxide with N2 Sparging

Filtration of Ni, Mn, Co Hydroxide in Air

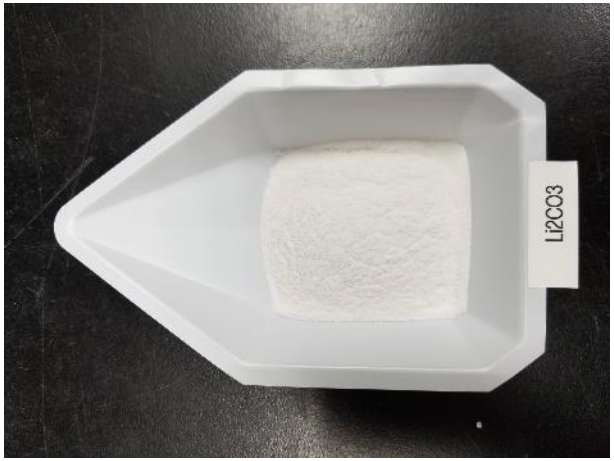
Precipitation of Li2CO3



Mother Solution After Removing Ni, Mn, Co Hydroxide (Contains Li)



Precipitation of Li2CO3

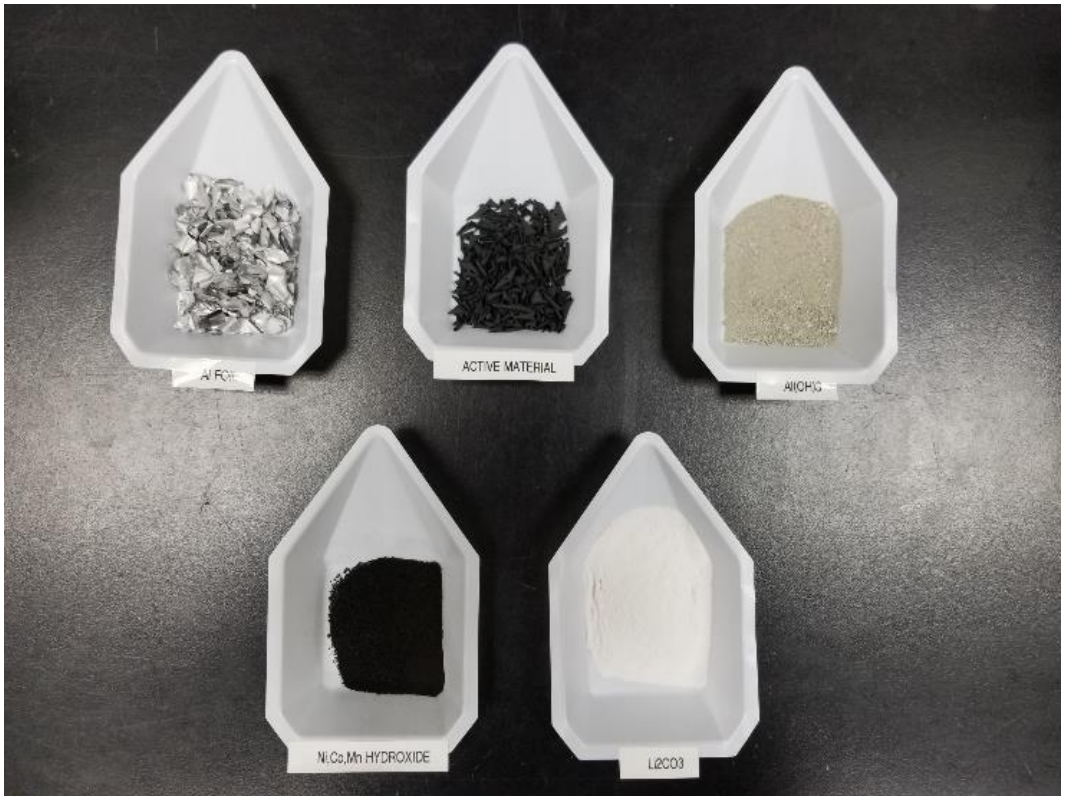


Li2CO3

Materials Produced from Recycling Cathode Scraps

- Single Pass Recovery
- Li Recovery to increase with locked cycle

Co	Mn	Ni	Li
97.50%	97.61%	97.23%	68.75%



Contacts

Larry Reaugh
E-mail: lreaugh@amymn.com

Zarko Meseldzija
E-mail: zmeseldzija@amymn.com

Norm Chow
E-mail: nchow@kemetco.com