ANL/ES-C1400101

Scale-up of Metal Hexacyanoferrate Cathode Material for Sodium Ion Batteries

Development of Process Parameters and Kilo Manufacturing-Final CRADA Report

Energy Systems Division

About Argonne National Laboratory
Argonne is a U.S. Department of Energy laboratory managed by UChicago Argonne, LLC under contract DE-AC02-06CH11357. The Laboratory's main facility is outside Chicago, at 9700 South Cass Avenue, Argonne, Illinois 60439. For information about Argonne and its pioneering science and technology programs, see www.anl.gov.

DOCUMENT AVAILABILITY

Online Access: U.S. Department of Energy (DOE) reports produced after 1991 and a growing number of pre-1991 documents are available free via DOE's SciTech Connect (http://www.osti.gov/scitech/)

Reports not in digital format may be purchased by the public from the National Technical Information Service (NTIS):
U.S. Department of Commerce
National Technical Information Service
5301 Shawnee Rd
Alexandria, VA 22312
www.ntis.gov
Phone: (800) 553-NTIS (6847) or (703) 605-6000
Fax: (703) 605-6900
Email: **orders@ntis.gov**

Reports not in digital format are available to DOE and DOE contractors from the Office of Scientific and Technical Information (OSTI):
U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
www.osti.gov
Phone: (865) 576-8401
Fax: (865) 576-5728
Email: **reports@osti.gov**

Disclaimer
This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor UChicago Argonne, LLC, nor any of their employees or officers, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of document authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof, Argonne National Laboratory, or UChicago Argonne, LLC.

ANL/ES-C1400101

Scale-up of Metal Hexacyanoferrate Cathode Material for Sodium Ion Batteries

Development of Process Parameters and Kilo Manufacturing- Final CRADA Report

prepared by
Gregory Krumdick, Trevor Dzwiniel, Kris Pupek
Energy Systems Division, Argonne National Laboratory

September 29, 2016

Argonne NATIONAL LABORATORY

Non Proprietary

Final CRADA Report

Date: 9-29-2016

CRADA Number: C1400101

CRADA Title: Scale-up of Metal Hexacyanoferrate Cathode Material for Sodium Ion Batteries

CRADA Start/End Date: 4/3/2014 to 12/21/2014

Argonne Dollars: 20,000

Participant Dollars: 80,000

Argonne PI: Gregory Krumdick

Participant(s):

Sharp Laboratories of America — 80,000
Name — Participant Dollars

SHARP LABORATORIES OF AMERICA
5750 NW PACIFIC RIM BLVD
CAMAS, WA 98607 USA
Complete Address

Name — Participant Dollars

Complete Address

Name — Participant Dollars

Complete Address

DOE Program Manager: _____

Summary of Major Accomplishments:

Sharp Laboratories of America (SLA) approached Argonne National Laboratory with a bench-scale process to produce material for a sodium-ion battery, referred to as Prussian Blue, and a request to produce 1 kg of material for their ARPA-E program. The target performance criteria was an average capacity of >150 mAh/g.

Summary of Major Accomplishments:

This initial process was investigated with regard to scalability. Several processing variables were identified and optimal ranges determined for such parameters as temperature, concentration, and addition rate.

Multiple batches of material were run at a 100g scale to determine final parameters. A final 100g batch was then performed as proof of concept demonstation. Analysis of the material confirmed that all physico-chemical and electrochemical measurements met or exceeded targets.

A final experiment was run to generate >1100g of Prussian Blue. Again, all physico-chemical and electrochemical measurements met or exceeded targets, in particular, the average capacity was about 160 mAh/g, with a current of 50 mA/g, greater than the target performance.

Summary of Technology Transfer Benefits to Industry:

Sharp Laboratories of America (SLA) was able to meet internal and ARPA-E project goals with the aid of Argonne National Laboratory scientists. Additional information, development, and analysis provided by Argonne National Laboratory yielded a more robust manufactuing platform and provided SLA with a scalable technology for future expansion.

Other Information/Results: (Papers, Inventions, Software, etc.)

Due to the propriatary nature of the project, no other results were generated.

Energy Systems Division
Argonne National Laboratory
9700 South Cass Avenue, Bldg. 370
Argonne, IL 60439

www.anl.gov

Argonne National Laboratory is a U.S. Department of Energy
laboratory managed by UChicago Argonne, LLC