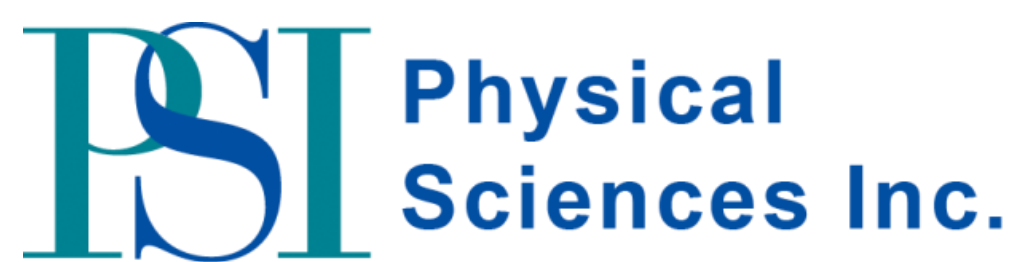


EFFICIENT PROCESS FOR THE PRODUCTION OF HIGH CONDUCTIVITY, CARBON-RICH MATERIALS FROM COAL

D. V. Preda, M.K. Song, J.H. Herb, N. Namusuuobo, T.R. Paul and C. M. Lang

Physical Sciences Inc.

INTRODUCTION



- PSI has developed an innovative approach for producing high value, carbon-based products from coal feedstocks
 - Main product is a high conductivity material for electrochemical applications
- The innovation is a two-step process that generates carbonaceous materials with key structural attributes resulting in high conductivity as well as valuable byproducts
- Phase I results demonstrated: (1) A robust and scalable process to produce the target carbon product; (2) Targeted performance in battery electrode formulations; and (3) Economic feasibility for scale up and commercialization

NEED

Domestic coal can be used to manufacture high value carbon products for multiple applications. The market value of these high performance materials often exceeds the fuel and heat value of coal, which illustrates there are sustainable market forces for manufacturing carbon materials from coal.

Current processes to produce high performance carbon materials from coal pose significant challenges associated with substantial chemical modifications of the native coal structures that require high temperatures and corrosive reagents.

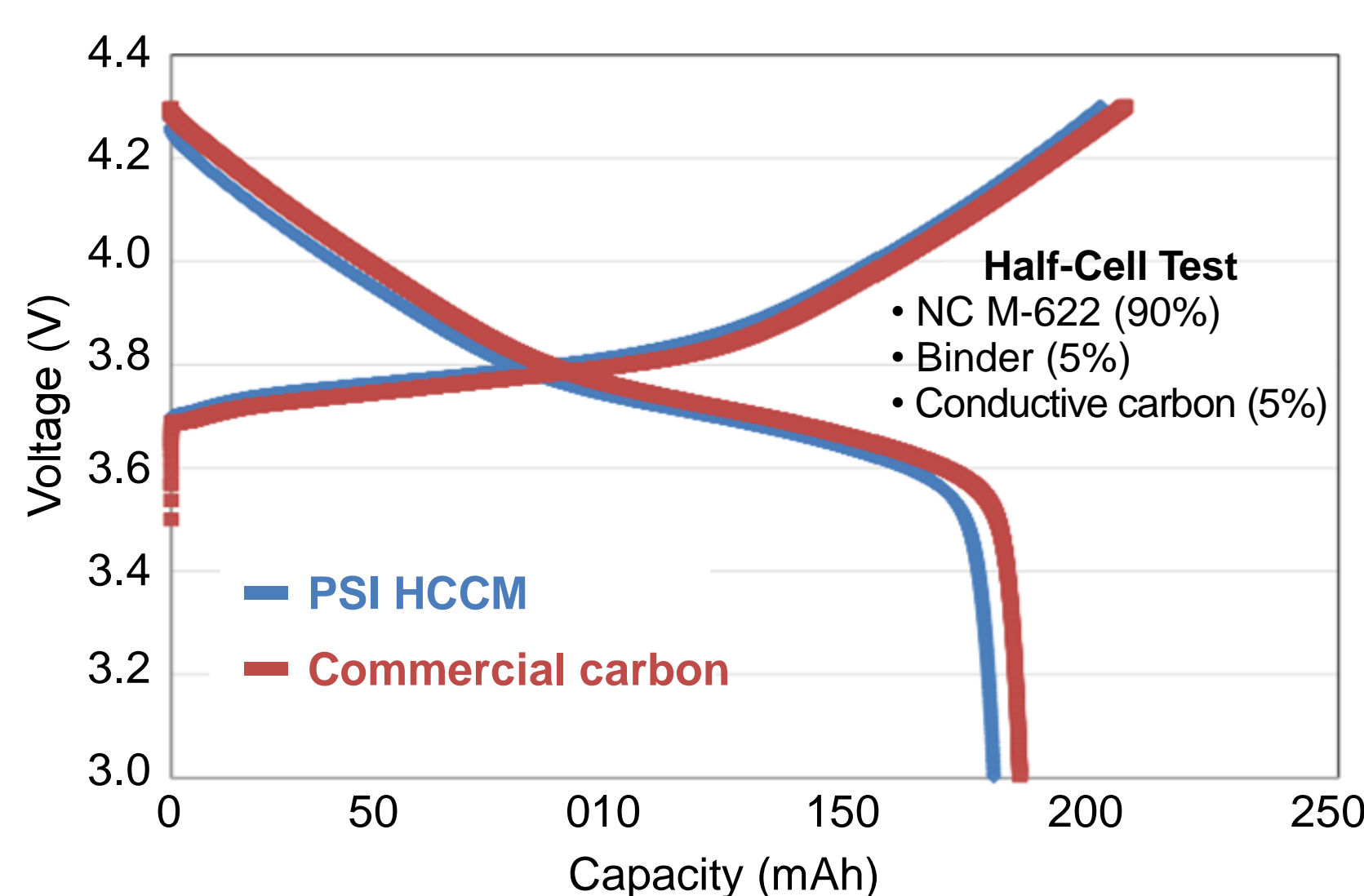
APPROACH

Novel approach with demonstrated technical objectives

- Coal samples suitable as feedstocks
- Coal pre-treatment processes with high yields
- Robust processes to produce high conductivity carbon materials (HCCM) from pre-treated coal
- Processes for the production of battery electrode formulations with HCCM
- Pathways for process economic viability
- Phase II transition plans

RESULTS

- Robust two step process to produce HCCM
- HCCM had low mineral content (Fe < 100 ppm) and high surface area > 50 m²/g
- HCCM was demonstrated in battery electrode formulations
 - Comparable performance to that of benchmark commercial product
- Preliminary techno-economic analysis demonstrated economic feasibility of scale-up plan



BENEFITS AND FUTURE WORK

Benefits

- Economically viable process to produce high value, conductive carbon-based materials from coal
- High conductivity carbon product with >20X higher value than the initial coal material
- Valuable byproducts for: (1) low-emission energy production and (2) trace elements recovery

Future work

- Process optimization and scale up
- Further demonstration of electrochemical applications
- Work with partner to develop commercialization plans

ACKNOWLEDGEMENTS

- Mr. Charles Miller (PM - DOE/NETL)
- Prof. Larry Scott (BC, emeritus)

REFERENCES

SBIR/STTR Topics. FY 2018, Phase I, Release 2, November 3, 2017
Topic # 18. ADVANCED MANUFACTURING & MATERIALS FOR FOSSIL ENERGY TECHNOLOGIES, Subtopic c. High Value Products from Coal