

# New Materials for Electric Drive Vehicles

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*Final CRADA Report*

Chemical Sciences and Engineering Division

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Chemical Sciences and Engineering Division, Argonne National Laboratory

Participants:  
American Energy Technologies Company  
Dontech Global, Inc.

October 18, 2016

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**Non Proprietary  
Final CRADA Report**

Date: October 18, 2016

CRADA Number: 11000801

CRADA Title: New Materials for Electric-Drive Vehicles

CRADA Start/End Date: 1/25/2012 to 1/24/2014

Argonne Dollars: \$210,000

Participant Dollars: \$"in kind"

Argonne PI: J. David Carter

Participant(s):

American Energy Technologies Company "in kind"  
(AETC) Participant Dollars  
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Dontech Global, INC. "in kind"  
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Complete Address

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Name Participant Dollars

\_\_\_\_\_  
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DOE Program Regina Carter  
Manager:

Summary of Major Accomplishments:

This project was sponsored by the US DOE Global Initiatives for Proliferation Prevention. The object was for Ukrainian and US partners, including Argonne, AETC, and Dontech to develop special carbon materials and factory production equipment with the goal of making better car batteries to achieve DOE's goals for all-electric and plug-in hybrid electric vehicles. Carbon materials are used in designs for lithium-ion batteries and metal-air batteries, both leading contenders for future electric cars. Specifically, the collaborators planned to use the equipment derived from this project to develop a rechargeable battery system that will use the carbon materials produced by the innovative factory process equipment.

#### Summary of Major Accomplishments:

The final outcome of the project was that the Ukrainian participants consisting of the Kharkov Institute of Physics and Technology (KIPT), the Institute of Gas of National Academy of Sciences of Ukraine and the Materials Research Center, Ltd. designed, built, tested and delivered 14 pieces of processing equipment for pilot scale carbon production lines at the AETC, Arlington Heights facilities. The pilot scale equipment will be used to process materials such as activated carbon, thermally expanded graphite and carbon coated nano-particles. The equipment was shipped from Ukraine to the United States and received by AETC on December 3, 2013. The equipment is on loan from Argonne, control # 6140.

#### Summary of Technology Transfer Benefits to Industry:

Plug-in hybrid electric vehicles (PHEV) and all-electric vehicles have already demonstrated success in the U.S. as they begin to share the market with older hybrid electric designs. When the project was conceived, PHEV battery systems provided a ~40 mile driving range (2011 figures). DOE R&D targets increased this to >100 miles at reduced cost less than \$250/kWh (2011 figures.) A 2016 Tesla model S has boasted 270 miles. The project object was to develop pilot-production line equipment for advanced hybrid battery system that achieves cycle life of 1000, an energy density of 280 Wh/kg and specific density of 600Wh/l. This project delivers factory equipment to produce these advanced battery materials.

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

The Ukrainian partners patented their equipment designs in Ukraine before the start of the project.

#### Conference presentations written from the project:

M.V. Gubynskiy, S.S. Fedorov, M.V. Livitan, I.V. Barsukov, O.G. Gogotsi, U.K. Rohatgi. Furnaces for manufacturing of high pure carbonaceous materials Conference: "Theory and practice of thermal processes in metallurgy", URFU , Yekateringburg, Russia (2012) – in Russian.

O.G.Gogotsi, N.P.Brodnikovskiy, Y.I. Zozyliya, V.V. Motronenko, P.V. Mazur, M.V. Gubinskiy, I.V. Barsukov, J. David Carter. Abrasive wear of the steel against coke. International conference PM "Powder Metallurgy: today and tomorrow", Kyiv, 2012

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