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Final Report: Enhancing the Research and Education Program in Advanced Materials at Benedict College: Acquisition of Raman Microscope, Nano Zetasizer and High-Temperature Catalyst Testing Systems

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W911NF-17-1-0538

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The views, opinions and/or findings contained in this report are those of the author(s) and should not contrued as an official Department of the Army position, policy or decision, unless so designated by other documentation.

14. ABSTRACT

15. SUBJECT TERMS

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RPPR Final Report
as of 23-Apr-2019

Agency Code:

Proposal Number: 70518CHREP **Agreement Number: W911NF-17-1-0538**
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Report Date: 24-Dec-2018 Date Received: 01-Mar-2019
Final Report for Period Beginning 25-Sep-2017 and Ending 24-Sep-2018
Title: Enhancing the Research and Education Program in Advanced Materials at Benedict College: Acquisition of Raman Microscope, Nano Zetasizer and High-Temperature Catalyst Testing Systems
Begin Performance Period: 25-Sep-2017 **End Performance Period:** 24-Sep-2018
Report Term: 0-Other
Submitted By: Changyong Qin Email: changyong.qin@benedict.edu
Phone: (803) 705-4582
Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees: 0 **STEM Participants:** 4

Major Goals: The major goals of the current project include (1) acquisition of Raman microscope, nano-zetasizer and high-temperature catalyst testing system, (2) improving the research infrastructure of Benedict College, (3) providing new opportunities to minority students in cutting-edge materials research, (4) promoting research collaborations between colleges and universities in the state of South Carolina, (5) improving capacity of Benedict College for serving DoD related research activities.

Accomplishments: Those have been achieved:
(1) Purchase and installation of Raman microscope
(2) Purchase and installation of nano-zetasizer
(3) Purchase and installation of high-temperature catalyst testing system
(4) Purchase and installation of glovebox
(5) Purchase and installation of Arbin battery testing system
(6) Student and faculty training of the new instrument
(7) Promoting research and education at Benedict College using the new instrument
(8) Increase of the funding opportunities for Benedict College

Training Opportunities: Instrument training sections offered to students and faculty in high level chemistry courses and during the summer research event.

Results Dissemination: Nothing to Report

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: Postdoctoral (scholar, fellow or other postdoctoral position)
Participant: Jingjing Tong
Person Months Worked: 12.00 **Funding Support:**

RPPR Final Report
as of 23-Apr-2019

Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Enhancing the Research and Education Program in Advanced Materials at Benedict College: Acquisition of Raman Microscope, Nano Zetasizer and High-Temperature Catalyst Testing Systems

Changyong Qin, Benedict College, Columbia, SC 29204 (PI)

PART A: STUDENT AND FACULTY TRAINING

The following students have been involved in the research activities supported by the current grant in the year of 2017-2018. They are all female African America students.

Daijha Boyd, Chemistry Major, Benedict College, B.S. Degree 2019 (expected)

Tamia Brice, Chemistry Major, Benedict College, B.S. Degree 2019 (expected)

Maria Melville, Biology Major, Benedict College, B.S. Degree 2019 (expected)

Bellami Cousar, Chemistry Major, Benedict College, B.S. Degree 2019 (expected)

Dr. Jingjing Tong, Postdoc Research Associate

PART B: INFRASTRUCTURE IMPROVEMENT

The following instrument and equipment have been purchased through the current grant and installed at the Center for Advanced Materials (CAM) at Benedict College. It serves a core facility for faculty/student research and also for the STEM education and community services.

Horiba XploRA Raman Microscope (QTN: 1)

Malvern Nano-ZS Zetasizer (QTN: 1)

Labstar Pro Glovebox (QTN: 1)

Arbin Battery Testing System (QTN: 1)

High-Temperature Catalyst Testing System with Micro GC (QTN: 1)

PART C: PUBLICATIONS AND PRESENTATIONS

The project funded by the current grant has led to one paper published in a peer-reviewed journal and two manuscripts being prepared and submitted in the near future. They are listed below.

Can molten carbonate be a non-metal catalyst for CO oxidation?
Jingjing Tong, Xueling Lei, Peng Zhang, Kevin Huang, Godwin Mbamalu and Changyong Qin, New Journal of Chemistry, 2018, 42, 16372.

Green fabrication of graphene using supercritical ball milling method and its application in electrochemical sensor for mercury

Jingjing Tong, Xueling Lei, Peng Zhang, Kevin Huang, Godwin Mbamalu and Changyong Qin, in preparation.

Chemically tailored graphene and its application in lithium-ion battery
Jingjing Tong, Xueling Lei, Peng Zhang, Kevin Huang, Godwin Mbamalu and Changyong Qin, in preparation.

PART C: OUTREACH ACTIVITIES

The instrument and equipment purchased from the current grant will support many on-campus community activities such as the Xtreme Technology Event for high school students and annual Harambee festival for the local African American community. Such activities will increase the number of minority students interested and devoted the STEM studies and careers.

Virtual Tour of the Center for Advanced Materials at Benedict College

Dr. Changyong Qin

Dept. of Biology, Chemistry and EHS
Center for Advanced Materials
Benedict College
Columbia, SC 29204

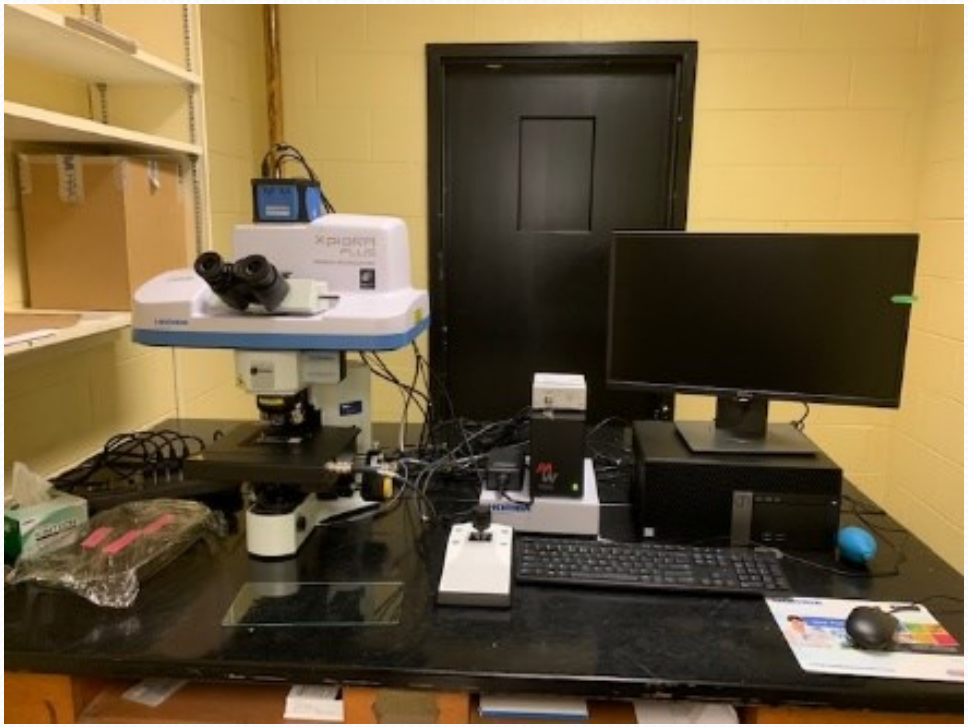
List of Instrument and Equipment

***Highlighted in blue: purchased from DoD support in the past six years

Highlighted in red: purchased from the current DoD grant

Chromatography (GC, HPLC)	FTIR PerkinElmer
Atomic Adsorption spectroscopy (AA)	UV-Visible spectroscopy
Total Organic Carbon Analyzer (TOC)	AMD (4-way) Opteron computing servers (Qtn: 10)
Planetary ball mill	Quad-GPU (NVidia C2050) supercomputers (Qtn:2)
High speed centrifuges	High speed disperser and mixer
High Temperature furnaces (Qtn: 5)	Thermal Gravity Analyzer (TGA)
BET pore and surface analyzer	Chemical reactor for materials synthesis
Bench top autoclave	X-ray diffraction crystallography
Differential Scanning Carolimetry (DSC)	Solartron electrochemical system
Braun glove box with gas purification	Rotary disc electrode (RDE) system
Raman spectroscopy	Freeze drying machine
Arbin battery analyzer/tester	Princeton VersaSTAT potentiostat
Catalyst testing tube reactor system	Atomic force microscopy (AFM)
Zeta-potential Nano Sizer (Malvern, Nano ZS)	High-pressure chemical reactor/vessel (Qtn: 6)

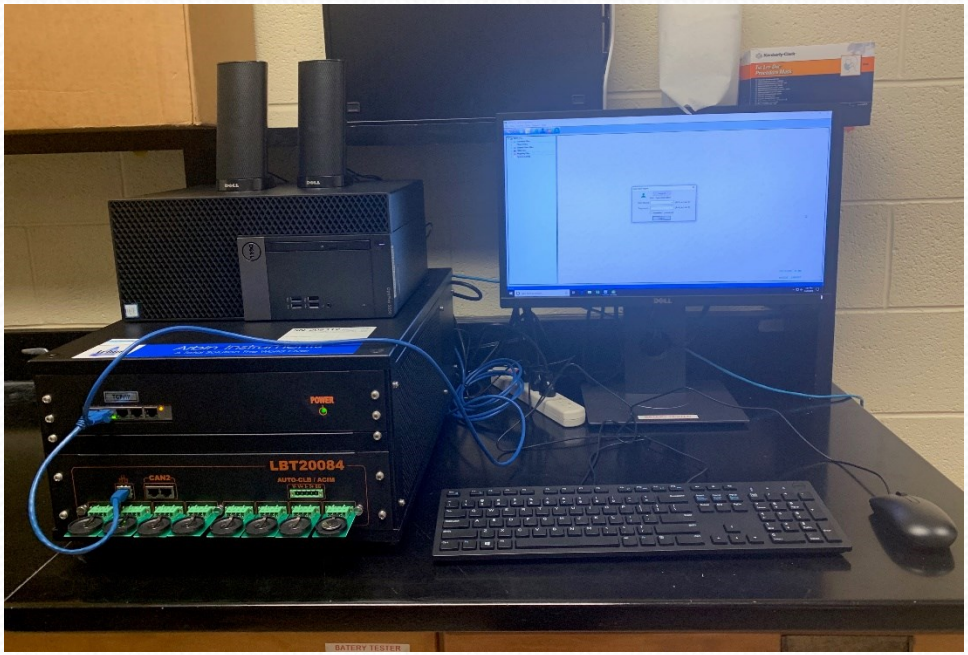
Horiba XploRA Raman Microscope



Malvern Nano-ZS Zetasizer

Labstar Pro Glovebox with Gas Purification

Arbin 8-Channel Battery Testing System



High-Temperature Catalyst Testing System

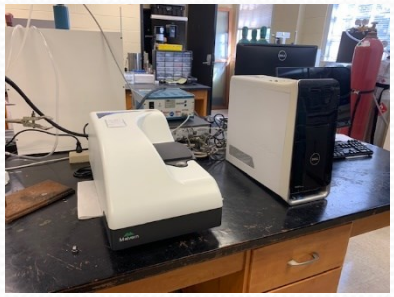
Lab Tour

Molecular Modeling

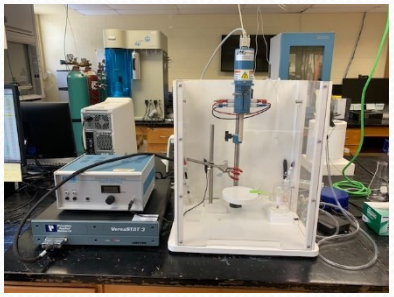
TGA/DTA

AFM Microscope

Raman Microscope



Nano Zetasizer



Rotary Disc Electrode

BET Analyzer

Ball Mill/Furnace

Glovebox

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