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14. ABSTRACT A four-laser, confocal Raman/Atomic Force Scanning microscope (Raman-AFM) (priced at ~ \$496,000) has been acquired From Horiba Scientific. Acquisition of this instrument has enhanced the research and educational capabilities of the Departments of Chemistry and Physics at North Carolina Central University (NCCU). The instrument provides more Raman capabilities as well as provides high resolution topographical and depth imaging capabilities through the AFM.					
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Report Title

Final Report: Acquisition of a Modular, Multi-laser, Raman-AFM Instrument for Multidisciplinary Research

ABSTRACT

A four-laser, confocal Raman/Atomic Force Scanning microscope (Raman-AFM) (priced at ~ \$496,000) has been acquired From Horiba Scientific. Acquisition of this instrument has enhanced the research and educational capabilities of the Departments of Chemistry and Physics at North Carolina Central University (NCCU). The instrument provides more Raman capabilities as well as provides high resolution topographical and depth imaging capabilities through the AFM.

Enter List of papers submitted or published that acknowledge ARO support from the start of the project to the date of this printing. List the papers, including journal references, in the following categories:

(a) Papers published in peer-reviewed journals (N/A for none)

<u>Received</u>	<u>Paper</u>
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TOTAL:

Number of Papers published in peer-reviewed journals:

(b) Papers published in non-peer-reviewed journals (N/A for none)

<u>Received</u>	<u>Paper</u>
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TOTAL:

Number of Papers published in non peer-reviewed journals:

(c) Presentations

Number of Presentations: 0.00

Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Peer-Reviewed Conference Proceeding publications (other than abstracts):

(d) Manuscripts

Received Paper

TOTAL:

Number of Manuscripts:

Books

Received Book

TOTAL:

Received Book Chapter

TOTAL:

Patents Submitted

Patents Awarded

Awards

Graduate Students

NAME

PERCENT SUPPORTED

FTE Equivalent:

Total Number:

Names of Post Doctorates

NAME

PERCENT SUPPORTED

FTE Equivalent:

Total Number:

Names of Faculty Supported

<u>NAME</u>	<u>PERCENT SUPPORTED</u>
FTE Equivalent:	
Total Number:	

Names of Under Graduate students supported

<u>NAME</u>	<u>PERCENT SUPPORTED</u>
FTE Equivalent:	
Total Number:	

Student Metrics

This section only applies to graduating undergraduates supported by this agreement in this reporting period

The number of undergraduates funded by this agreement who graduated during this period: 0.00

The number of undergraduates funded by this agreement who graduated during this period with a degree in science, mathematics, engineering, or technology fields:..... 0.00

The number of undergraduates funded by your agreement who graduated during this period and will continue to pursue a graduate or Ph.D. degree in science, mathematics, engineering, or technology fields:..... 0.00

Number of graduating undergraduates who achieved a 3.5 GPA to 4.0 (4.0 max scale):..... 0.00

Number of graduating undergraduates funded by a DoD funded Center of Excellence grant for Education, Research and Engineering:..... 0.00

The number of undergraduates funded by your agreement who graduated during this period and intend to work for the Department of Defense 0.00

The number of undergraduates funded by your agreement who graduated during this period and will receive scholarships or fellowships for further studies in science, mathematics, engineering or technology fields:..... 0.00

Names of Personnel receiving masters degrees

<u>NAME</u>
Total Number:

Names of personnel receiving PHDs

<u>NAME</u>
Total Number:

Names of other research staff

<u>NAME</u>	<u>PERCENT SUPPORTED</u>
FTE Equivalent:	
Total Number:	

Sub Contractors (DD882)

Inventions (DD882)

Scientific Progress

A four-laser, confocal Raman/Atomic Force Scanning microscope (Raman-AFM) (priced at \$496,000) which will enhance the research and educational capabilities of the Departments of Chemistry and Physics at North Carolina Central University (NCCU) has been acquired from Horiba Scientific. The instrument provides unique Raman capabilities as well as providing high resolution topographical and depth imaging capabilities through the AFM which we currently lack. Installation and training of primary users on the instrument was completed in January. Training of undergraduate and Masters students is ongoing and acquisition of useful data has begun.

The primary focus initially has been the study of single layered graphene as grown by chemical vapor deposition on copper foils. The four lasers range from the blue to 785 nm and provides a unique handle to determine excitation dependence of the Raman spectrum. Excitation at 473 using the blue line provides a convenient way to suppress luminescence background originating from the copper substrate. Simultaneous topographical imaging enables us to identify defects and discontinuities in the single layer.

We are also beginning work on functionalizing the graphene surface and we hope to do some conductive AFM by the end of this summer.

Technology Transfer