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14. ABSTRACT
With this equipment funding support, a FL300-12 Automated Alignment System was acquired from Ficontec (USA) Corporation for optical characterization and membrane printing/assembly. The system has the following features: Micro-precision alignment with integrated 50 nm stages for precise in-plane waveguide alignment; Gantry motion system for sub-micron precision pick-and-place assembly of NMs and micro-optics; Integrated device characterization for both in-plane and surface-normal photonic devices.
This assembly and characterization system will significantly enhance the PI and other key personnel's research

15. SUBJECT TERMS
Optoelectronics, assembly, nanomanufacturing, optical characterization, automation, lasers, semiconductors

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a. REPORT	b. ABSTRACT	c. THIS PAGE			Weidong Zhou
UU	UU	UU	UU		19b. TELEPHONE NUMBER 817-272-1227

Report Title

Final Report: Optical Assembly and Characterization System for Nano-Photonics Research

ABSTRACT

With this equipment funding support, a FL300-12 Automated Alignment System was acquired from Ficontec (USA) Corporation for optical characterization and membrane printing/assembly. The system has the following features: Micro-precision alignment with integrated 50 nm stages for precise in-plane waveguide alignment; Gantry motion system for sub-micron precision pick-and-place assembly of NMs and micro-optics; Integrated device characterization for both in-plane and surface-normal photonic devices.
This assembly and characterization system will significantly enhance the PI and other key personnel's research capability in conducting various research works related to silicon based infrared laser and multiwavelength laser arrays, high speed modulators, electronics, photodetectors, for optical interconnect, hyper-spectral imaging, and spectroscopic gas sensing and separation applications.

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)

Received Paper

TOTAL:

Number of Papers published in peer-reviewed journals:

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

Received Paper

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

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Names of Under Graduate students supported

NAME	PERCENT_SUPPORTED

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

NAME

Total Number:

Names of personnel receiving PHDs

NAME

Total Number:

Names of other research staff

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Sub Contractors (DD882)

Inventions (DD882)

Scientific Progress

See attachment.

Technology Transfer

Final Report

Submitted to ARO Program Manager Dr. Michael Gerhold

Project: **DoD HBCU/MI Equipment Program**

Agreement Number: W911NF-15-1-0035

Report Date: Mar 2016 (For the period of Dec. 22, 2014 to Dec. 21, 2015)

Title: Optical Assembly and Characterization System for Nano-Photonics Research

PI: **Prof. Weidong Zhou**, University of Texas at Arlington (UTA) 500 S. Cooper St., Arlington, Texas 76019-0072; Tel: 817-272-1227; Email: wzhou@uta.edu;
Key Personnel: Prof. Yuze (Alice) Sun, University of Texas at Arlington (UTA)

With this equipment funding support, a FL300-12 Automated Alignment System was acquired from Ficontec (USA) Corporation for optical characterization and membrane printing/assembly. The system has the following features: Micro-precision alignment with integrated 50 nm stages for precise in-plane waveguide alignment; Gantry motion system for sub-micron precision pick-and-place assembly of NMs and micro-optics; Integrated device characterization for both in-plane and surface-normal photonic devices.

Figure 1 FL300-12 Automated Alignment System for optical characterization and membrane printing/assembly.

This assembly and characterization system will significantly enhance the PI and other key personnel's research capability in conducting various research works related to silicon based infrared laser and multiwavelength laser arrays, high speed modulators, electronics, photodetectors, for optical interconnect, hyper-spectral imaging, and spectroscopic gas sensing and separation applications.

This new system can drastically boost the nanoscale-related research and STEM education capabilities at UTA, and to attract more students from under-represented groups into STEM careers. It will provide critical research training in the area of nanophotonics, optoelectronic and electronic materials, devices and systems for undergraduate and graduate students participating on the related research projects.

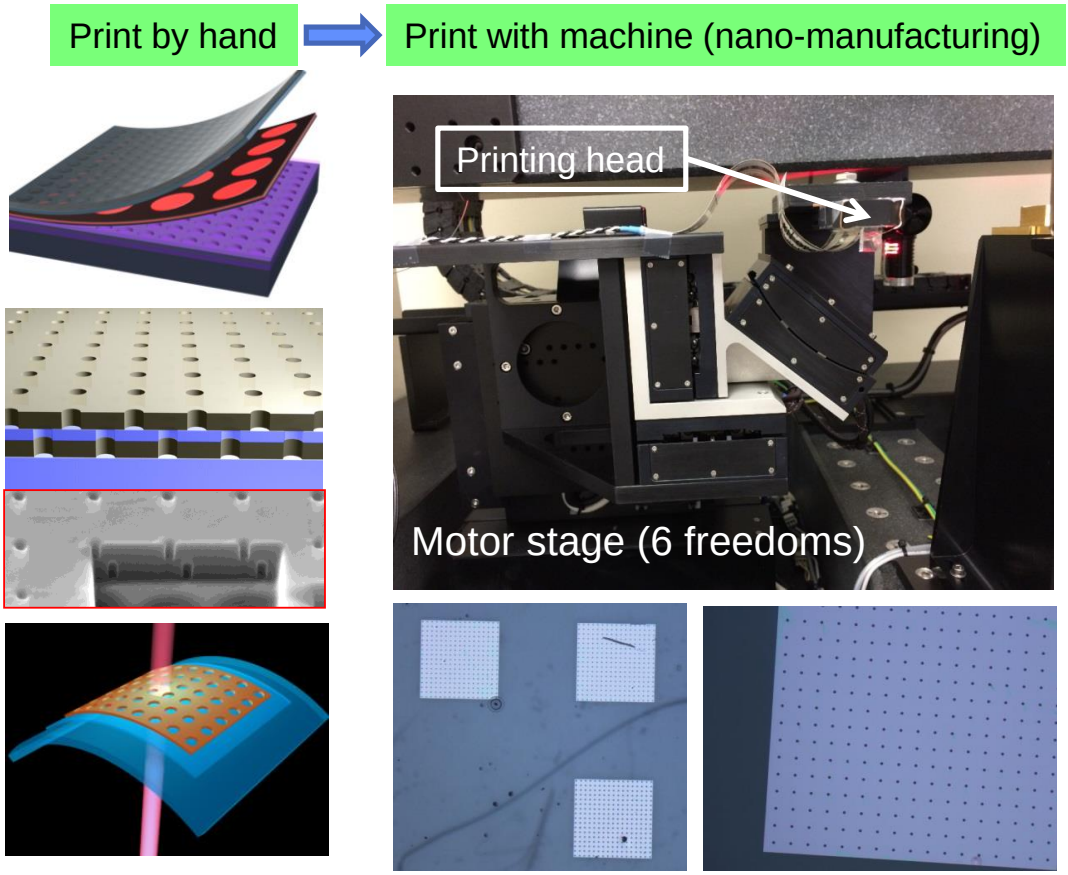

Figure 2 Preliminary results of printed silicon membranes based on the customer designed printing head with pressure sensor mounted on the motor stage with 6 degrees of freedom and sub-micron accuracy.

Major Accomplishments:

(1) Complete system installation;

(2) Integrated this system with various pieces of optical testing equipment, including light source, monochrometer, optical spectral analyzer, detectors, and probes. Will be used for a wide range of optoelectronic devices and integrated systems research.

(3) Carried out initial research work related to semiconductor membrane transfer printing. Based on the customer designed PDMS stamp printing head with embedded pressure sensor mounted on the motor/alignment stage with 6 degrees of freedom, high quality Si membranes were successfully transferred, as shown in Fig. 2 (bottom right figures);

(4) Currently there are two students have learned and checked out the operational setup and routine maintenance of this tool.

(5) More research work is being carried out on this tool for infrared membrane lasers, detectors, and sensors research.

Research and Educational Project for which the equipment to be used:

(1) **Printed High Speed High Efficiency Membrane Lasers (ARO contract # W911NF-15-1-0431):** The tool enables two objectives of the research project: **Objective 1:** Scaling of semiconductor nanomembrane lasers towards extreme energy efficient integrated photonics/electronics, with applications in communications, computing, sensing, imaging, etc. **Objective 2:** Transition of current lab-based NM PDMS transfer printing process by hand to scalable process with machines compatible with conventional micro- and nano-fabrication.

(2) Student training: These versatile experimental setups will serve as the power tool for the student training for both graduate and undergraduate students.