SAND2012-1711P

Project Accomplishment Summary

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Sandia National Laboratories

Operated for the U.S. Department of Energy by
Sandia Corporation
Albuquerque, New Mexico

PROJECT ACCOMPLISHMENTS SUMMARY

Cooperative Research and Development Agreement (#1573.78)

between **Sandia National Labs** and Lockheed Martin Corporation

Note: This Project Accomplishments Summary will serve to meet the requirements for a final abstract and final report as specified in Article XI of the CRADA.

Title: Carbon Nanotube IR Detectors (SV)

Final Abstract:

Sandia National Laboratories (Sandia) and Lockheed Martin Corporation (LMC) collaborated to (1) evaluate the potential of carbon nanotubes as channels in infrared (IR) photodetectors; (2) assemble and characterize carbon nanotube electronic devices and measure the photocurrent generated when exposed to infrared light;(3) compare the performance of the carbon nanotube devices with that of traditional devices; and (4) develop and numerically implement models of electronic transport and opto-electonic behavior of carbon nanotube infrared detectors. This work established a new paradigm for photodetectors.

Background:

Existing infrared photodetectors require cooling, expensive lithography, and operate over narrow frequency ranges. Carbon nanotube devices promise uncooled devices, tunable frequency ranges, and compatibility with silicon lithography. Sandia had extensive knowledge of carbon nanotubes, and had performed detailed modeling work to study the photoresponse of carbon nanotubes. Sandia had also demonstrated the capabilities (personnel, infrastructure) to assemble carbon nanotube devices and test their electrical properties. Capabilities in the optical characterization of devices also existed. Lockheed Martin has extensive experience and business needs for infrared photodetectors. In the carbon nanotube arena, Lockheed Martin has capabilities in growth of carbon nanotubes and has developed strategic partnerships with industry and academia in the areas of nanotube synthesis and device fabrication.

Description:

The purpose of the project was to evaluate the potential of carbon nanotubes as replacements for existing materials in infrared detectors. Sandia demonstrated the infrared photoresponse of these novel materials, and established modeling frameworks for nanotube-based electronic and photonic devices. Lockheed Martin brought extensive knowledge of the application space that enabled the development of devices. The project was awarded the Lockheed Martin Excellence in Engineering Award.

Benefits to the Department of Energy:

Infrared photodetectors are pervasive in the DOE/NNSA complex, being used for treaty monitoring, ground monitoring, targeting systems, and aerial defense. This project opened a new avenue for exploring novel nanomaterials to improve the performance of IR detectors.

Economic Impact:

The project established a new paradigm for infrared photodetectors that could revolutionalize that industry, and allowed industry to develop capabilities in the handling, assembly, electronic, and optical characterization of carbon nanotubes.

Project Status:

Completed

ADDITIONAL INFORMATION

Laboratory/Department of Energy Facility Point of Contact for Information on Project

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Company Size and Points of Contact

Steve Sinton
Lockheed Martin Space Systems
Palo Alto, CA
650-424-2532

CRADA Intellectual Property

Copyright for software Nanotube (SCR #1054.0)

Technology Commercialization

No commercialization

Project Examples

No project examples

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Cooperative Research and Development Agreement (SC99/01573.78)
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This summary has been approved for public release by Sandia and Lockheed Martin Corporation

Sandia National Laboratories

By _____ _____ 7/18/11
Francois Leonard Date
Principal Investigator

Sandia National Laboratories

By _____ 6/23/2011
Manager Date
WFO/CRADA Agreements

Lockheed Martin Corporation

By _____ _____
Title: Date

In order to expedite the process, if we do not receive your signed reply by _____ we will assume your concurrence for the release of this document to the public.

From: Sinton, Steve
To: Cover, Danielle Alexandra
Subject: RE: PAS for CRADA 1573.78
Date: Tuesday, September 20, 2011 6:33:47 PM

Hi, Danielle: our public release of this PAS is complete. You may proceed.

Sws

Steve Sinton
(650) 424-2532
steve.sinton@lmco.com

From: Cover, Danielle Alexandra [mailto:dacover@sandia.gov]
Sent: Monday, September 19, 2011 7:29 AM
To: Sinton, Steve
Subject: EXTERNAL: FW: PAS for CRADA 1573.78

Mr. Sinton,

Do you know the status of this document that is going through your public release process? If you need anything from me just let me know.

Thanks,
Dani

From: Cover, Danielle Alexandra
Sent: Tuesday, August 16, 2011 11:46 AM
To: 'steve.sinton@LMCO.com'
Subject: PAS for CRADA 1573.78

Mr. Sinton,

Attached is the electronic version of the PAS you have received. As you requested I will not assume compliance until the document goes through your public release process. If you have any other questions or concerns please don't hesitate to ask.

Thanks,
Dani Cover
CRADA Administrator
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