ANL/NST-C1400701

NCD Diamond Semiconductor System for Advanced Power Electronics Systems Integration

CRADA Report

Nanoscience and Technology Division, Argonne National Laboratory

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July 22, 2016

Argonne NATIONAL LABORATORY

Non Proprietary

Final CRADA Report

Date: 07/22/2016

CRADA Number: 1400701

CRADA Title: NCD Diamond Semiconductor System for Advanced Power Electronics Systems Integration

CRADA Start/End Date: 12/5/2014 to 04/15/2016

Argonne Dollars: $0

Participant Dollars: $175,859.34 cost, Authorized funds ($212,105)

Argonne PI: Anirudha Sumant

Participant(s):

Adam Khan
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Participant Dollars

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DOE Program Manager:

Summary of Major Accomplishments:

The integration of 2D materials such as molybdenum disulphide (MoS2) with diamond (3D) was achieved by forming an heterojunction between these two materials and its electrical performance was studied experimentally. The device charactertics did show good rectifying nature when p-type single crystal diamond was integrated with n-type MoS2. These results are very encouraging indicating possible applications in semiconductor electronics, however further studies are required for a detailed understanding of the transport phenomena at the MoS2/diamond interface.

Summary of Major Accomplishments:

*The CRADA was terminated by Argonne on April 15, 2016.
*The original scope of the work (SOW) was modified significantly as per discussion with Akhan semiconductor Inc.

Summary of Technology Transfer Benefits to Industry:

The work performed under this CRADA produced a new technology of integarting 2D materials with diamond to fabricate heterojunction devices that could be utilized in semiconductor electronics without the traditional approach of forming p-n junction devices through well controlled chemical vapor deposition process. Although the study is not complete (since the project was terminated), this approach of integrating 2D materials with 3D materials could lead to some interesting device concepts in semiconductor electronics

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

ANL invention disclosure ANL-IN-15-097 "Fabrication of p-n junction devices through diamond/2D materials integration"
*A separate file contaning the results obtained along with the description is attached. The ANL presentation of the patent disclosure is also attached

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