U.S. AIR FORCE TECHNOLOGY TRANSFER PROGRAM OFFICE

SUCCESS WITH

COOPERATIVE RESEARCH AND DEVELOPMEMT AGREEMENT

AFRL MATERIAL TRANSFER

Agreement Leads to International Research Grant with Australia

CONTRACT NUMBER:
16-278-RX-01

COMPANY NAME:
Griffith University
Australia

TECHNICAL PROJECT OFFICE:
AFRL/RX
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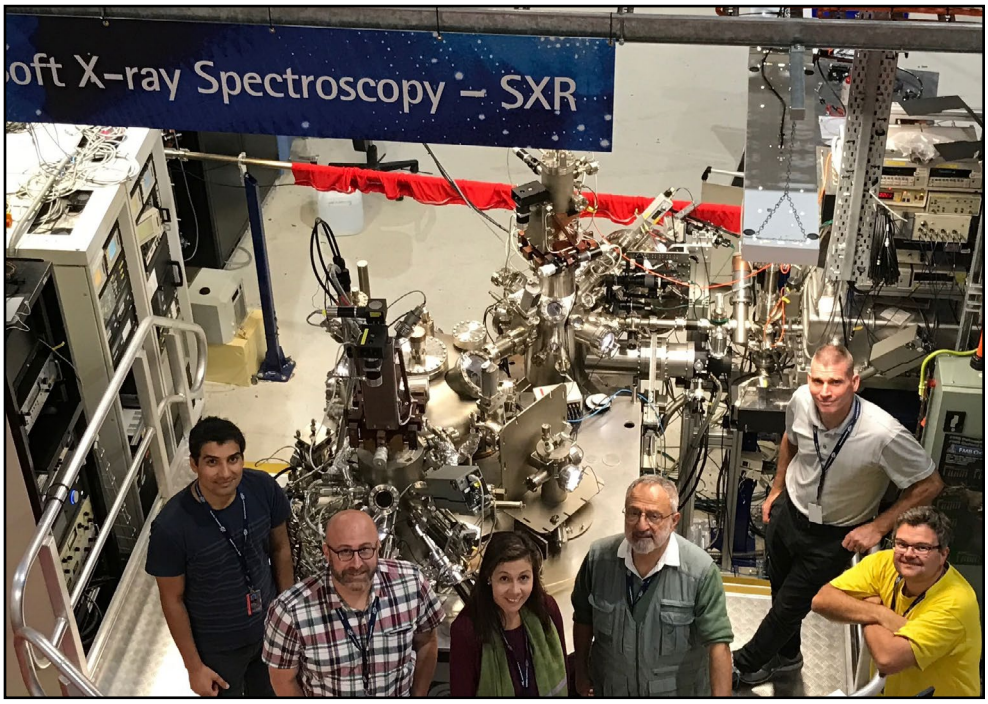
WRIGHT-PATTERSON AIR FORCE BASE, Ohio – A recent material transfer agreement between the Air Force Research Laboratory Materials and Manufacturing Directorate (AFRL/RX) and the Griffith University of Nathan, QLD 4111, Australia resulted in international cooperative research and development grant. The new agreement is between AFRL/RX, the Naval Research Laboratory and the Australian Defense Science and Technology Group.



A team of researchers from the Air Force Research Laboratory Materials and Manufacturing Directorate, Griffith University, and Australian Synchrotron Facility are pictured in the Soft X-Ray Spectroscopy laboratory. (Photo courtesy of Dr. John Boeckl)

Pictured from left to right: Mojtaba Amjadi Pour (QUT student), Tyson Back (AFRL contractor, Surface Scientist), Francesca Iacopi (former professor at Griffith University, currently at Univeristy of Technolgy Sydney) Patrick Soukiassian (long-time collaborator from CEA-Saclay, Synchrotron Expert), John Boeckl (AFRL/RX), and Anton Tadich (Australian Synchrotron, Beamline Scientist).

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An MTA is one type of limited-purpose Cooperative Research and Development Agreement that allows for quick collaboration with the Air Force. A CRADA is a legal agreement between a federal laboratory and one or more nonfederal parties such as private industry and academia. CRADAs offer both parties the opportunity to leverage each other's resources when conducting research and development that is mutually beneficial.

Under the MTA and with partial funding under a grant from the Asian Office of Aerospace Research and Development, the Air Force Office of Scientific Research's international office in Tokyo, the university delivered samples of epitaxial cubic silicon carbide (3C-SiC) on silicon (Si) substrates. The purpose of the agreement was for the Air Force to investigate the graphene fabrication that results from the 3C-SiC material. Graphene is a material of interest for several applications, including electronic device development, because of its high conductivity, flexibility and strength.

The directorate has had a working relationship with the university for several years. Griffith University also houses an Australian NanoFabrication Facility Node for growing SiC epitaxially on a silicon substrate. The university is one of only a handful of groups in the world that can fabricate this material and one of only two that grow and then convert it into graphene.

"The CRADA was a helpful tool to formalize this research collaboration, spell out the IP that would be owned by each organization, and effectively outline the scope of the research being conducted," said Dr. John Boeckl, the AFRL/RX materials scientist leading the effort.

AFRL scientists conduct cross-sectional transmission electron microscopy to evaluate the material quality, helping to guide the graphene synthesis development, and scientists at the Naval Research Laboratory measure the plasmonic response of nano-scaled device structures fabricated from the material. The team also submitted a proposal to the Australian Synchrotron Facility in Melbourne and was granted use of the facility's Soft-X-ray Spectroscopy testing equipment. This allowed the team to conclusively identify the existence of the buffer layer of graphene on the 3C-SiC, which was known for graphene grown on bulk hexagonal poly-types of SiC, but was unconfirmed on the cubic poly-type. These results will be a key in refining future device structures.

As a result of the MTA CRADA and the favorable plasmonic response measured, the research was awarded a grant from the Secretary of the Air Force, International Affairs Office. In addition, an official Project Agreement will be established between AFRL/RX, the Naval Research Laboratory and the Australian Defense Science and Technology Group (DSTG). This research will focus on complex low-loss plasmonic structures based on Griffith University graphene material.

"Working with the US Air Force, and other US military laboratories has been a boon to my research interests, and shows how a strong international collaboration can enhance and benefit each country's interests," asserted Francesca Iacopi, the Griffith University professor whose pioneering graphene synthesis from SiC has earned her numerous awards. She recently accepted a new position at the University of Technology in Sydney where she will continue to pursue this research.

For more information about technology transfer opportunities with the Air Force, call the Air Force Technology Transfer Program Office at 937-904-9830.