Special Notice 13-SN-0001
Special Program Announcement for the Office of Naval Research
Research Opportunity: Select Topics in Nanoscience and Nanotechnology

I. INTRODUCTION:

This announcement describes a research thrust, entitled "Select Topics in Nanoscience and Nanotechnology" to be launched under the ONRBAA 13-001, Long Range Broad Agency Announcement for Navy and Marine Corps Science and Technology which can be found at http://www.onr.navy.mil/Contracts-Grants/Funding-Opportunities/Broad-Agency-Announcements.aspx. The research opportunity described in this announcement specifically falls under the following sections of ONRBAA 13-001:

Topic #1- Graphene Photonics in the Infrared and Terahertz Regime:
Section I, entitled "General Information", sub-section 6, entitled "Research Opportunity Description", the "Command, Control Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) (Code 31)" item, paragraph 2), listed item h), entitled "Nanoscale electronics".

Topic #2 - Novel Nanomaterial Approaches to Processing of Ultra-High Temperature Materials:
Section I, entitled "General Information", sub-section 6, entitled "Research Opportunity Description", the "Sea Warfare and Weapons Department (Code 33)" item, paragraph 2), sub-paragraph b, entitled "Structural Materials".

Topic #3 - Nanoscale Non-Line-of-Sight Conformal Coatings with Controlled Electronic Properties:
Section I, entitled "General Information", sub-section 6, entitled "Research Opportunity Description", the "Sea Warfare and Weapons Department (Code 33)" item, paragraph 2), sub-paragraph a, entitled "Functional Materials".

The requirements of proposal submission, evaluation and award of any resulting grants will subject to ONRBAA 13-001.

The purpose of this announcement is to focus attention of the scientific community on (1) the area to be studied, (2) for dialogue amongst those interested in this arena, and (3) the planned timetable for the submission of white papers and proposals.

II. TOPIC DESCRIPTION:

Background:

The selected topics in this special notice are designed to address research and technology gaps in the area of nanoscience and nanotechnology in ONR's current program portfolio. The program

will pursue fundamental research in several specific topics that complement and enhance existing programs in related areas.

Objective:

The Office of Naval Research (ONR) is interested in receiving proposals on the following research topics:

Topic #1- Graphene Photonics in the Infrared and Terahertz Regime
Topic #2 - Novel Nanomaterial Approaches to Processing of Ultra-High Temperature Materials
Topic #3 - Nanoscale Non-Line-of-Sight Conformal Coatings with Controlled Electronic Properties

The *objective* of this announcement is to encourage research and innovation in these selected topic areas and foster technology transition that benefit future war-fighters and meet Navy needs.

The program will address technical challenges in each of the selected areas.

Program Focus and Scope:

Topic #1 - Graphene Photonics in the Infrared and Terahertz Regime:

The topic will encourage and support fundamental research aimed at elucidating and utilization of the peculiar behavior of graphene in the infrared (IR) and terahertz (THz) spectral range. The basic research topics that are of interest to ONR include, but are not limited to: (1) ultra-fast carrier dynamics and emission characteristics of graphene in IR and THz; (2) exploration and testing of possible lasing conditions in graphene; (3) novel graphene based plasmonic circuitry operating in IR/THz range; (4) exploitation of synergy between photo-emission and plasmonics in graphene and ways for integrating the two functions that are mutually enhancing on a single graphene device.

Topic #2 - Novel Nanomaterial Approaches to Processing of Ultra-High Temperature Materials:

There are very few materials with melting temperatures over 3000ºC that are capable of use in engineering components in applications over 2000ºC in oxidizing environments. Outside of tungsten metal and thorium oxide, all of the compounds are transition metal non-oxide ceramics (borides, carbides, and nitrides), referred to as ultrahigh temperature ceramics, or UHTCs. The objective of this program is to demonstrate the synthesis and processing of UHTC materials with unprecedented ambient and high temperature mechanical properties. This program involves three general, interrelated tasks: (1) Development of processing routes for the synthesis of high purity nanoparticles of candidate UHTC phases such as ZrB_2, TaC, HfB_2, etc. This effort would rely on previous work on boride and nitride ceramics, which have been produced in kilogram quantity. (2) Exploration of the phase diagrams of UHTC compositions to identify phases with very low mutual solubility. (3) Investigation of the effects of applied electric field on the sintering of multiphase UHTC nanoparticles. This would include fundamental research into the

origins of the very high rate field assisted sintering phenomena and examination of the control of inter-phase diffusion during processing.

Topic #3 - Nanoscale Non-Line-of-Sight Conformal Coatings with Controlled Electronic Properties:

A key challenge both for three-dimensional (3D) power sources and complex, compact power systems is the ability to apply nanoscale-thick, pinhole-free non-line-of-sight conformal coatings to irregular and porous surfaces. In many cases, including aperiodic foam-like structures (xerogels and aerogels) and high-aspect-ratio nanorod-based arrays that often serve as the basis for 3D power source architectures, there is no direct line-of-sight access to modify all of the interior surface area with the requisite conformal coating. Furthermore, the porous architecture of the base substrate typically needs to be preserved for subsequent introduction of additional components (for example a second electrode phase), such that methods to incorporate the conformal coating must be carefully controlled or self-limiting. The objective of this program is to develop and demonstrate scalable, manufacturable deposition and processing methods for nanoscale, pinhole-free, non-line-of-sight conformal coatings with controlled electrical properties. Areas of interest include, but are not limited to: (1) polymeric, inorganic and/or composite films, (2) demonstration of well-controlled/tuned electrical properties that span electrically conducting, ion conducting, and/or insulating based on the materials composition and deposition and processing methods, (3) a family or families of materials/material compositions for different application spaces (i.e., materials for systems/applications that require low-temperature processing versus those that can accommodate higher-temperature processing), (4) validation of the electrical properties of nanoscale films derived from non-line-of-sight deposition methods.

IV. WHITE PAPER SUBMISSION

White papers should not exceed 4 single-sided pages, exclusive of cover page and resume of principal investigator(s). Additional formatting specifications for White Paper format can be found in the ONRBAA 13-001

The cover page should be labeled “White Paper for 2012 Research Opportunity: Select Topics in Nanoscience and Nanotechnology " and include the following information: title of the proposed effort, offeror technical point of contact, offeror telephone number, offeror fax number, and offeror e-mail address. The white paper shall also include the proposed period of performance and proposed dollar amount.

The 4-page body of the white paper should include the following information: (1) Principal Investigator(s); (2) Relevance of the proposed effort to the research areas described in Section II; (3) Technical objective of the proposed effort; (4) Technical approach that will be pursued to meet the objective; (5) A summary of recent relevant technical breakthroughs; and (6) A funding plan showing requested funding per fiscal year. Resume(s) of the principal investigator(s), not to exceed 1 page per principal investigator, should also be included after the 4-page body of the white paper.

Although not required, white papers are strongly encouraged for all offerors seeking funding. Each white paper will be evaluated by the Government to determine whether the technology advancement proposed appears to be of particular value to the Department of the Navy. Initial Government evaluations and feedback will be issued via e-mail notification from the Technical Point of Contact. The initial white paper appraisal is intended to give entities a sense of whether their concepts are likely to be funded.

Detailed Full Proposals will be subsequently encouraged from those Offerors whose proposed technologies have been identified through the above referenced e-mail as being of "particular value" to the Government. However, any such encouragement does not assure a subsequent award. Full Proposals may also be submitted by any offeror whose white paper was not identified as being of particular value to the Government or any offeror who did not submit a white paper.

For white papers that propose efforts that are considered of particular value to the Navy but either exceed available budgets or contain certain tasks or applications that are not desired by the Navy, ONR may suggest a full proposal with reduced effort to fit within expected available budgets or an effort that refocuses the tasks or application of the technology to maximize the benefit to the Navy.

White papers shall be submitted directly and electronically to each of the appropriate topic technical points of contact.

To ensure full, timely consideration for funding, white papers should be submitted **no later than 12 NOV 2012**. White papers received after that date will be considered as time and availability of funding permit.

The planned date for completing the review of white papers is **06 DEC 2012**.

V. FULL PROPOSAL SUBMISSION AND AWARD INFORMATION

Full proposals should be submitted under ONRBAA 13-001 by **17 JAN 2013**. Full Proposals received after that date will be considered as time and availability of funding permit.

ONR anticipates only **grants** will be issued for this effort. All full proposals must be submitted through www.grants.gov. The following information must be completed as follows in the SF 424 to ensure that the application is directed to the correct individual for review:

Block 4a, Federal Identifier: Enter "N00014"
Block 4b, Agency Routing Number: Enter the three (3) digit Program Office Code and the Program Officer's name as shown below:

Topic #1: "312 (Baatar, Chagaan)"
Topic #2: "332 (Kabacoff or Wuchina)"

Topic #3: “332 (Anderson, Michele)”

All attachments to the application should also include this identifier to ensure the proposal and its attachments are received by the appropriate Program Office.

Anticipated Funding:

Topic #1:
ONR plans to fund up to one (1) award with an approximate not-to-exceed value of $2,000,000 for a total period of performance of 36 months with a maximum number of team members not-to-exceed five (5) unique entities. NOTE: Lower funding amounts will be considered.

Topic #2:
ONR plans to fund up to three (3) awards that will typically average $500,000 for a total period of performance of 36 months. There is no maximum number of team members for each award. NOTE: Higher or lower amounts will also be considered.

Topic #3:
ONR plans to fund up to one (1) award with an approximate not-to-exceed value of $1,800,000 for a total period of performance of 36 months with a maximum number of team members not-to-exceed six (6) unique entities. NOTE: Lower funding amounts will be considered.

Although ONR expects the above described program plan to be executed, ONR reserve the right to make changes.

Funding decisions should be made by **14 FEB 2013**. Projects will have an estimated award date of **01 APR 2013**.

VII. POINTS OF CONTACT

In addition to the points of contact listed in ONRBAA 13-001, the specific points of contact for this announcement are listed below:

Technical Points of Contact:
Topic #1: Dr. Chagaan Baatar, Program Officer, Code 312, (chagaan.baatar@navy.mil).
Topic #2: Dr. Lawrence Kabacoff, Program Officer, Code 332, (lawrence.kabacoff@navy.mil).
Alternate Technical Point of Contact for Topic #2: Dr. Eric Wuchina, Program Officer, Code 332, (eric.wuchina@navy.mil).
Topic #3: Dr. Michele Anderson, Program Officer, Code 332, (michele.anderson1@navy.mil).

Business Point of Contact:
All Topics: Mr. Ryan Farrell, Contract Specialist, BD253, (ryan.farrell@navy.mil).

VIII. Submission of Questions

Any questions regarding this announcement must be provided to the Technical Points of Contact and/or the Business Point of Contact listed above. All questions shall be submitted in writing by electronic mail.

Questions regarding **White Papers or Full Proposals** should be submitted NLT two weeks before the date and time for receipt of White Papers or Full Proposals. Questions after these dates may not be answered.