

Department of the Navy SBIR/STTR Transition Program

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HYBRIDSIL® ANTI-ICING, ICEPHOBIC COATINGS FOR U.S. NAVY SUPERSTRUCTURES

NanoSonic, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: Code 33

Transition Target: U.S. Navy Ships Operating in Arctic Environments

TPOC:

Dr. Ki-Han Kim
kihan.kim@navy.mil

Other transition opportunities: In addition to PEO-Ships (R. Mitchell), PMS 400F (E. Macfarlane), NAVSEA 05T (M. Bosworth), broad secondary applications exist for robust, passive ice protection within demanding cold weather environments for the Coast Guard, especially with their Next Generation Ice Breaker Program.

Notes: HybridSil IPC's easily spray deposited within a broad spectrum of environments, and is suitable for in-the-field application and repair of NanoSonic's existing commercially available HybridShield Icephobic topcoats.



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WHAT

Operational Need and Improvement: NanoSonic's HybridSil Ice Protective Coating (IPC) will provide a practical, near-term solution for protecting U.S. Navy ships from problematic ice buildup during arctic missions.

Specifications Required: In this program, novel passive, not requiring power, anti-icing materials that are also ice-phobic will be developed that will meet the following performance requirements: (1) Ice adhesion strength less than 30 kPa that will be proven by an independent government laboratory through repeated tests; (2) Operate effectively in temperatures down to -30°C in salt water and fresh water; (3) Durable and abrasion resistant in simulated or actual operating environments, warm and cold. Vendor must demonstrate anti-icing and deicing capability and durability of the surface for the equivalent of one year of ship-board use (multi-season) in Beaufort Sea or Chukchi Sea conditions; (4) Affordable manufacturing techniques for covering ship superstructures and hulls (cost effectiveness); and (5) Ease of application to ship superstructures and other deck equipment (cost effectiveness), including recoat over existing material, or material removal if necessary.

Technology Developed: HybridShield Icephobic Aerosol offers excellent ice shedding performance, with the added benefits of environmental durability and corrosion protection in a one-part nanocomposite coating. Surfaces coated with HybridShield Icephobic Aerosol exhibit drastically reduced ice adhesion which enables fast, effortless ice removal. HybridShield Icephobic Aerosol promotes environmental versatility through exceptionally robust abrasion resistance. It is easily spray deposited within a broad spectrum of environments and is suitable for in-the-field application and repair of existing HybridShield Icephobic topcoats.

Warfighter Value: The direct benefits that will be provided to the U.S. Navy over less durable, costly icephobic silicones and commercial superhydrophobic coatings include vastly enhanced environmental durability, ease of spray or roll on application, self-priming substrate adhesion, and a significantly improved return-on-investment.

WHEN

Contract Number: N68335-16-C-0120 **Ending on:** December 31, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate Retained Icephobicity After Simulated Exposure	Med	Ice Adhesion < 30 kPa	4	September 2017
Optimize Rheological Properties and Cure Kinetics of Spray and Roll on Deposited HybridSil IPC Coatings for Near-term Shipyard Acceptance and Integration	Med	Equivalent Deposition Metrics as Current Navy Topcoats	4	December 2017
Qualify Phase II Optimize HybridSIL IPC as a TYPE V MIL-PRF-24635 Topcoat to Certify it on the Navy's Qualified Product List (QPL)	Med	Passing Test Metrics per MIL-PRF-24635E	5	July 2018
Pilot Scale Manufacturing Using ISO 9001 Compliant Manufacturing Protocols and Complete Shipyard Integration Efforts with Technical Warrant Holder's Approval	Med	55 to 200-Gallon Manufacturing Established	6	February 2020

HOW

Projected Business Model: NanoSonic's primary commercialization strategy through the proposed Phase II STTR is to become the sole source supplier and distributor of its HybridSil IPC to the U.S. Navy by qualifying it as a MIL-PRF-24635E Type V high durability coating and then aggressively marketing its paradigm breaking, previously unavailable combination of ice protective properties and extreme marine environmental durability. The first actual product integration will be any U.S. Navy vessel that currently uses a MIL-PRF-24635 protective coating and is in need of improved ice protection

Company Objectives: NanoSonic, Inc. is a private company specializing in advanced materials. We are headquartered in Pembroke, Virginia, near the main campus of Virginia Tech. Our work is focused on the development and manufacture of novel materials. We offer research and development services to other companies and organizations, especially with an eye towards prototyping and commercialization.

NanoSonic's HybridSil Icephobic coating would be acquired by the Navy and Defense Primes. The key to integration will be the creation (by the Navy) of a performance specification specifically for icephobic topside coatings on ship structures. This will be similar in scope to performance specification MIL-PRF-24635E for the corrosion protective coatings seen on all Navy ships.

Potential Commercial Applications: Successful development of the low adhesion anti-icing/ice-phobic surfaces that are durable and easy to apply to a large area will benefit an enormous range of commercial applications including marine transportation in the Arctic regions, commercial airplanes before flight (deicing), and the power industry (prevent ice accumulation on power lines).

Contact: Vince Baranauskas, Ph.D., Chief Technical Officer
vince@nanosonic.com (540) 626-6266