through processing that demonstrates scalability.
- Films must be less than 20 microns thick and should be free standing.
- Samples will be tested for dielectric performance (permittivity, dielectric loss, film resistance) at 1 kHz and at various temperatures between 25C and 125C.
- Samples will be tested to dielectric breakdown at room temperature.
- At least 10 measurements will be made to provide statistics.
- At room temperature, the energy storage density based on permittivity and breakdown should exceed that of BOPP and have dielectric losses below 0.3%.
- At 125C the dielectric film should retain a volume resistivity of 10^14 ohm.m or higher.

The offeror will be able to submit a reasonable number of films to the Navy for testing during Phase I and expect results in a reasonable time (less than 2 weeks).

PHASE II: The goals of Phase II are to fully develop an optimum dielectric film processed on commercial or near commercial* equipment and to demonstrate performance both on the film level and in wound capacitors. Work may include synthesis scale-up, process development runs on commercial or near commercial equipment, studies of the influence of processing variables on film morphology and dielectric properties, etc. There should be a milestone near the midpoint of this effort to finalize film work and begin work towards the wound capacitor deliverable. At this point, film samples will again be supplied to the Navy. Based on the characteristics of the optimized film, metrics for the wound capacitors will be agreed upon. Typical metrics might be for delivering several 10 joule capacitors with a 1 kHz discharge time, graceful failure, desired temperature performance, and a wound capacitor energy density above 2 J/cc.

*Near commercial equipment has capability and features such that the width of the film (amount of raw materials required) and the speed of the machine are the only major operating differences relative to commercial equipment.

PHASE III: The goal of Phase III is to deliver a number of fully packaged capacitors for potential use in a military component.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Capacitors are part of all electrical components. The focus in this solicitation is for increased energy density and a higher thermal performance window relative to capacitors produced from the most common dielectric film currently used for larger (applications besides microelectronics) capacitors. If successful, the dielectric film will likely compete against established capacitors made using BOPP, especially where volume is critical or when the electronics are housed in a hot environment.

REFERENCES:
1. “A Dielectric Polymer with High Electric Energy Density and Fast Discharge Speed,” B. Chu, et al., Science 313, 334 (2006)

2. “Phosphonic Acid-Modified Barium Titanate Polymer Nanocomposites with High Permittivity and Dielectric Strength,” P. Kim, et al, Adv. Mater. 2007, 19, 1001-1005.

3. "Enhanced Breakdown Strength of Multilayered Films Fabricated by Forced Assembly Microlayer Coextrusion" M. Mackey, et al. J. Phys. D: Appl Phys. (2009) 42, 175304.

KEYWORDS: wound capacitor; dielectric film; metalized film; graceful failure; polymer; processing

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N121-096 TITLE: Persistent Anchorless Active Sonar Deployable Surface Buoy

TECHNOLOGY AREAS: Ground/Sea Vehicles, Sensors

ACQUISITION PROGRAM: SWMS User Operational Evaluation System (UOES) proposed by OPNAV N2/N6

RESTRICTION ON PERFORMANCE BY FOREIGN CITIZENS (i.e., those holding non-U.S. Passports): This topic is “ITAR Restricted”. The information and materials provided pursuant to or resulting from this topic are restricted under the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120 - 130, which control the export of defense-related material and services, including the export of sensitive technical data. Foreign Citizens may perform work under an award resulting from this topic only if they hold the “Permanent Resident Card”, or are designated as “Protected Individuals” as defined by 8 U.S.C. 1324b(a)(3). If a proposal for this topic contains participation by a foreign citizen who is not in one of the above two categories, the proposal will be rejected.

OBJECTIVE: Develop an anchorless deployable surface buoy that can provide persistent active sonar operations in excess of two weeks without recourse to mooring.

DESCRIPTION: Several autonomous active sonar processing projects have come to fruition in the last five years, primarily for short duration applications that are intended for deployment from the air. The limited efforts to develop ship-deployable systems that can operate for extended periods have produced successful systems, but persistence was achieved at the expense of deployability. The Navy needs a deployable field of active sonar systems that can be used in all depths of water and achieve tactical anti-submarine control of an area for several weeks.

The persistent anchorless active sonar system should contain a float or small craft for suspension of the sonar arrays, a low-frequency source and receiver array, and on-board processing and communications. The float or small craft must be capable of holding the system on station. The maximum size of the system must be such that two entire units, when made ready for deployment, can fit in a standard ISO shipping container (8'x20'). Achieving this form factor in a persistent station-keeping system is viewed as the primary technical challenge, as the sonar system is likely to contribute significant drag that must be compensated for in the design. The successful proposal must identify the anchorless station-keeping mechanism, provide a workable active sonar design for anti-submarine warfare, and show a notional deployment and retrieval concept for the unit.

PHASE I: The means of providing persistent power and holding station will be identified and the design justified in terms of size, endurance and power output for sonar operations. The successful Phase I project will identify the critical design elements and model all aspects of system operation to show that the design is achievable in practice and could be made suitable for deployment and retrieval from a surface ship..

PHASE II: A persistent anchorless active sonar platform will be constructed, including hotel power, thrusters, navigation and communications for remote control of the system. In this phase, use of a surrogate for the sonar, such as a dummy load and/or representative drag and weight components is acceptable. Once the platform had been developed, a test at sea or in a representative environment will be conducted. The successful Phase II project will result in a tested persistent anchorless active sonar platform that can be readily deployed and retrieved from a surface ship.

PHASE III: The prototype developed in Phase II will be integrated with a suitable active sonar system and used in a trial for detection of targets at sea. The successful Phase III project will, working with acquisition project managers, conduct a full-scale proof-of-concept test of the system including deployment, operation at sea for at least 2 weeks, and retrieval.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Technology developed under this topic will be applicable to persistent instrumentation challenges in ocean monitoring, marine fisheries and deep-sea oil exploration.

REFERENCES:
1. Curcio, J., McGillivary, P., Fall, K., Maffei, A., Schwehr, K., Twiggs, B., Kitts, C., & Ballou, P., "Self-Positioning Smart Buoys, The 'Un-Buoy' Solution: Logistic Considerations using Autonomous Surface Craft Technology and Improved Communications Infrastructure," Proceedings of IEEE Oceans 2006, 2006.

2. Curtin, T., Crimmins, D., Curcio, J., Benjamin, M.,Roper, C., Autonomous Underwater Vehicles: Trends and Transformations," The Marine Technology Society Journal, vol 39, number 3, 2005.

KEYWORDS: Active sonar; persistence; anti-submarine warfare; deployable systems

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N121-097 TITLE: Improved High Frequency Communications

TECHNOLOGY AREAS: Information Systems

ACQUISITION PROGRAM: MARCORSYSCOM PRC-150; and Marine Expeditionary Rifle Squad

OBJECTIVE: Improve reliability and predictability of time-of-day dependent high-frequency (HF) channels by providing high-throughput ionospheric skywave or Near-Vertical Incidence Skywave HF (e.g., 2-30 MHz frequency band) communications with a throughput of at least 100 kb/s.

DESCRIPTION: HF communications technologies have not been actively developed or improved in recent years with the exception of