Department of the Navy SBIR/STTR Transition Program

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ONR Approval # 43-2203-16

Topic # N132-137
Low-loss Optical Polymer Materials in Multi-kilogram Quantities for Optical Lens Development
Tetramer Technologies, LLC

WHO

SYSCOM: ONR

Sponsoring Program: Office of Naval Research (ONR) Code 30 Fires

Transition Target: AN/PVS-14 Monocular Night Vision Device (MNVD) Technical Refresh

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Other transition opportunities: Air Force Battle Airmen Night Vision Goggles
Consumer Night Vision
Satellite Lenses
Consumer Photography

Courtesy of the US Air Force

WHAT

Operational Need and Improvement: Modern polymer lens designs offer dramatic size and weight reduction, increased focusing power, and improved aberration correction compared to conventional ceramic lenses. While significant progress has been made in polymer processing and lens manufacture, domestic sources of polymers possess forward scattering optical loss that limits the resolution of optical systems. High performance polymers with ultra-low optical losses are needed at commercially viable scales in order to enable light weight polymer lenses to be use in amplified optical systems such as night vision.

Specifications Required: The ultra-low loss optical polymers should possess total optical loss less than 0.5 dB/m from 350 to 1650 nm, on-axis scattering less than 0.5%, refractive index from 1.35 to 1.72, Abbe numbers from 20 to 80, compatible melt processing in standard polymer extrusion and molding conditions, and domestic production quantities of at least 10 kg.

Technology Developed: Tetramer is developing polymeric materials with ultra-low optical loss for use in polymer lenses. Through optimization of the chemical structure of the polymer and synthetic methods, Tetramer will domestically produce high purity polymers with reduced optical absorbance and superior clarity, resulting in improved imaging capabilities, especially in amplified optical systems.

Warfighter Value: Evolving polymer lens technologies offer drastic increases in focusing power and reduction in weight of optical performance compared to traditional ceramic lenses. Lightweight night vision optics assist the warfighter by lightening the physical load that they carry on their helmet, which is a source of neck fatigue and injury. Additionally, by improving the resolution and focusing power of polymer lenses in night vision goggles, Tetramer high performance optical polymers will allow the warfighter to access to more information, providing a technological advantage that could save lives.

WHEN

Contract Number: N00014-15-C-0105 **Ending on:** January 29, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate ultra-low optical loss polymers	Med	Total optical loss less than 0.5 dB/cm and less than 0.5% scattering loss	5	February 2017
Demonstrate multi-kilogram production of low loss optical polymers	Low	At least 5 kg per batch production	5	February 2017
Scale production to 10 kg and demonstrate low loss polymer lenses	Med	At least 10 kg of polymer produced for lens manufacture	6	November 2017

HOW

Projected Business Model: Tetramer will develop and manufacture the ultra-low loss optical polymers. Working with strategic partners for lens design and manufacturing, Tetramer will bring high performance polymer lenses to systems designers and device manufacturers.

Company Objectives: Tetramer's objective at the FST event is to identify additional Program Offices and programs of records where light weight, high performance optical lenses are needed. As a materials supplier, it is critical that Tetramer identify strategic partners for lens production and device manufacture in order to transition these advanced polymers into optical systems that assist our warfighters. Having demonstrated the compatibility of Tetramer optical polymers with standard processing conditions, Tetramer is pursuing both Primes and other SBIR companies with complimentary manufacturing capability for sampling materials and device development.

Potential Commercial Applications: Consumer Night Vision: Increased resolution in night vision surveillance to improve detection of pedestrians or intruders in both automobiles and homes.

Consumer Optics: Excellent optical properties result in large reductions in weight and cost in high-end scopes and binoculars.

Photography: Increasing demand for lightweight, high resolution screens and lenses in cellphones and digital cameras.

Satellites: Reduction in weight of lenses would significantly reduce launch costs.

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