Department of the Navy SBIR/STTR Transition Program

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Topic # N24A-T021
Synthesis and Scale-Up of Metal Diboride Precursors for Chemical Vapor Infiltration
AsterTech LLC

WHO

SYSCOM: ONR

Sponsoring Program: Navy STTR Topic N24A-T021 (ONR)

Transition Target: Navy and DoW high-temperature material insertion pathways for ceramic matrix composite components used in extreme thermal and propulsion environments, including hypersonic thermal protection and hot-section structures.

TPOC: Peter Kaczmarek
Peter.m.kaczmarek2.civ@us.navy.mil

Other Transition Opportunities: Joint hypersonic systems, missile thermal protection, rocket nozzles, turbine hot-section components, advanced energy systems, semiconductor processing, and high-temperature industrial coatings.

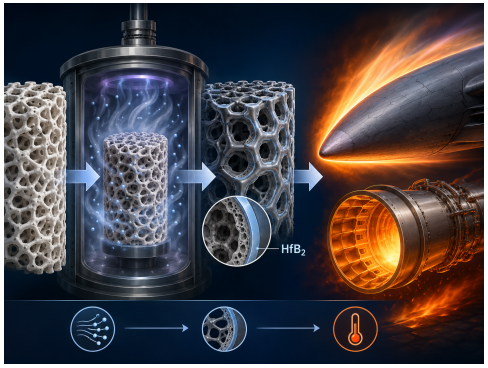

Image courtesy of AsterTech LLC, 2026.

Notes: AsterTech is developing a domestic, scalable precursor and coating pathway for ultra-high-temperature ceramic materials. Phase I reduced risk through successful precursor scale-up, proof-of-concept coatings, and initial infiltration studies. CVD means Chemical Vapor Deposition, CVI means Chemical Vapor Infiltration, and CMC means Ceramic Matrix Composite.

WHAT

Operational Need and Improvement: Advanced Navy and Department of War (DoW) platforms benefit from materials that retain strength, oxidation resistance, and dimensional stability in extreme-temperature environments. A scalable vapor-phase route for refractory diboride coatings can help extend the performance envelope of ceramic matrix composite (CMC) components used in thermal protection, propulsion, and other high-heat systems.

Specifications Required: The technology should provide a stable, scalable, vapor-deliverable refractory diboride precursor suitable for Chemical Vapor Infiltration into ceramic matrix composite preforms. Required performance includes repeatable precursor production, safe handling and delivery, controlled Chemical Vapor Deposition and Chemical Vapor Infiltration processing, conformal coating or infiltration of representative porous substrates, and validation of thermal, mechanical, and structural properties for extreme-temperature defense applications.

Technology Developed: AsterTech is developing a domestic precursor and vapor-phase processing platform for ultra-high-temperature ceramic coatings, focused on hafnium diboride and related refractory diboride materials. Our effort will advance precursor scale-up, integrate the material into Chemical Vapor Deposition and Chemical Vapor Infiltration processes, improve safe delivery and reactor operation, and generate coated ceramic matrix composite samples for Navy-relevant evaluation.

Warfighter Value: This technology can help enable lighter, more durable, and more thermally resilient components for future Navy and DoW systems operating in extreme heat environments. By supporting improved ceramic matrix composite performance and a domestic supply path for advanced coating materials, the approach can reduce transition risk, strengthen supply-chain resilience, and give warfighters access to materials that expand the operating envelope of high-temperature platforms.

WHEN

Contract Number: N68335-26-C-0083 **Ending on:** Jan 19, 2028

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase I proof-of-concept for precursor scale-up and boride film deposition completed	N/A	Repeatable precursor batches, thin-film deposition, and preliminary CVD studies demonstrated	3	3rd QTR FY25
Phase II CVD/CVI process integration and safety framework established	Low	CVD/CVI setup, handling protocols, monitoring/scrubbing approach, and baseline deposition runs completed	4	2nd QTR FY26
Scaled precursor production and coated composite validation completed	Medium	10 to 100 gram batch scale-up, coated CMC samples, and characterization data for thermal, structural, and mechanical properties completed	4	2nd QTR FY27
process optimization and transition package completed	Medium	Computational Fluid Dynamics, Artificial Intelligence optimization, environmental testing, scale-up safety assessment, and partner-ready data package completed	5	2nd QTR FY28

HOW

Projected Business Model: AsterTech will retain core intellectual property and process know-how while transitioning the technology through Navy, DoW laboratory, prime contractor, and qualified manufacturing partners. Near term revenue will come from pilot-scale precursor supply, coated test articles, process data, and technical support. For production, AsterTech will pursue licensing, contract manufacturing, and co-development with U.S.-based specialty chemical, ceramic matrix composite, and system integration partners to support safe scale-up and DoW platform insertion.

Company Objectives: AsterTech's objective is to transition this technology from Phase II validation into Navy and DoW evaluation through coated ceramic matrix composite samples, process data, and pilot-scale production. The company seeks Navy, prime contractor, CMC manufacturer, and U.S. specialty chemical partner engagement to define qualification requirements, identify test articles, and establish a Phase III defense transition path.

Potential Commercial Applications: Potential commercial applications include aerospace and space-launch components, rocket nozzles, turbine hot-section materials, ceramic matrix composites, industrial furnace hardware, semiconductor manufacturing components, wear-resistant coatings, and advanced energy systems. After defense validation, AsterTech will pursue adjacent commercial markets through specialty materials partners, CMC manufacturers, and licensing or contract manufacturing relationships.

Contact: Dr. Santanu Bag, President
sbag@astertechs.com (937) 912-1317