



ADVANCED CERAMETRICS, INC.

MULTIFUNCTIONAL ACTIVE FIBER COMPOSITES FOR SENSORS AND ACTUATORS

A Skier Using Head Sport's Intelligence Skies Powered by ACI's Piezoelectric Ceramic Fibers

About the Technology

Advanced Cerametrics, Inc. (ACI) has developed a technique that produces flexible piezoelectric fibers, suitable for high performance sensor and actuator applications. Using this technique, non-piezoelectric fibers from almost any ceramics can be produced for structural reinforcement applications. Piezoelectric materials convert mechanical energy into electricity and, inversely, convert electricity into mechanical energy. ACI's fiber technology makes composites with high fracture toughness that are much harder to break. Ceramic fibers made from ACI's Viscous Suspension Spinning Process (VSSP) are flexible, lightweight, and inexpensive to produce.

ACI also developed a new technology, which allows ACI to apply its flexible ceramic material to address additional military needs, including a new actuator/sensor design for helicopter rotors. The technology reduces vibration and gearbox wear, by actively controlling the blade flexure and harvesting the reclaimed energy to power such systems from ambient sources of mechanical energy. Funding was provided to develop technology to produce piezoelectric ceramic fibers for sensors, actuators and, most recently, energy harvesting systems. ACI has a contract with Head Sports, for its Piezoelectric Fiber Composites (PFC) that is used for its "intelligence" line of tennis rackets and skis and has resulted in several million dollars of Head Sports product sales.

Military and Commercial Significance

ACI's piezoelectric-fiber composite technology and energy harvesting transducers have enormous applications within DoD. The piezoelectric fiber material has led to improved stealth in DoD platforms by reducing vibration noise through embedded active structural control. Using piezoelectric fiber composites, to convert wasted energy to power monitors that oversee the status of shipboard and airborne structures and equipment, eliminates the need for expensive batteries or heavy and labor intensive power cabling. The technology has led to several commercial and DoD R&D contracts, and is currently being used for a health monitoring systems for the DDG 1000, and the development of other naval systems.

APPLICATIONS

- Navy - Fiber composite actuators for torpedo silencing and helicopter rotor twist control
- Navy - Piezoelectric ceramic fibers for sensors and actuators
- Navy - Self-powered health monitoring systems for the DDG 1000
- Lightweight sonar and disposable sonobuoys
- Self-powered wireless rotor tips lights

About the Company

Advanced Cerametrics Inc. (ACI) has evolved from a small, family owned manufacturer of ceramic wear parts for the textile industry, to a prominent, high-tech company developing and manufacturing advanced materials. The SBIR/STTR program enabled ACI to develop and commercialize its active fiber composite and achieve orders and contracts exceeding \$4.5 million. ACI's piezoelectric fiber composites technology is the basis for the development of a cost effective fiber production method, and has allowed the company to attract venture capital companies, grow its business, and expand its product line.

Topic Number: N95-T005
(ONR)

SBIR Investment: \$760K
Project Revenue: \$8.5M

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