




ADVANCED   
**CERAMETRICS**  
I N C O R P O R A T E D



## Advanced Cerametrics Generates Electricity from Waste Mechanical Energy to Power Electronic Systems, Eliminating or Augmenting Batteries

Advanced Cerametrics, Inc. (ACI) has developed a patented technology to make nearly any ceramic material into fiber form. Ceramic fiber composites can eliminate the traditional drawbacks of ceramic (brittleness and heavy weight) by being light, robust, and flexible. Latest examples of this technology include: (1) energy harvesting for wireless sensor systems, which are self-powered via environmental vibrations (no batteries required); (2) health monitoring systems using ambient mechanical energy as the power source; and (3) fibers for 'very high' temperature applications such as reinforcement of hypersonic missile leading edges and radomes, and (4) high strength ceramic fibers for metal-ceramic lightweight composite armor.

### *Flexible ceramic fibers for reinforcement, energy harvesting, and active structural control*

Advanced Cerametrics, Inc., an R&D and manufacturing company supplies:

- Products for piezoelectric energy harvesting
- Advanced structural ceramics and fiber composite materials
- Products for active structural control
- Custom molded ceramics & ceramic components for the automotive, aerospace, consumer, and textile industries

## HISTORY & VISION

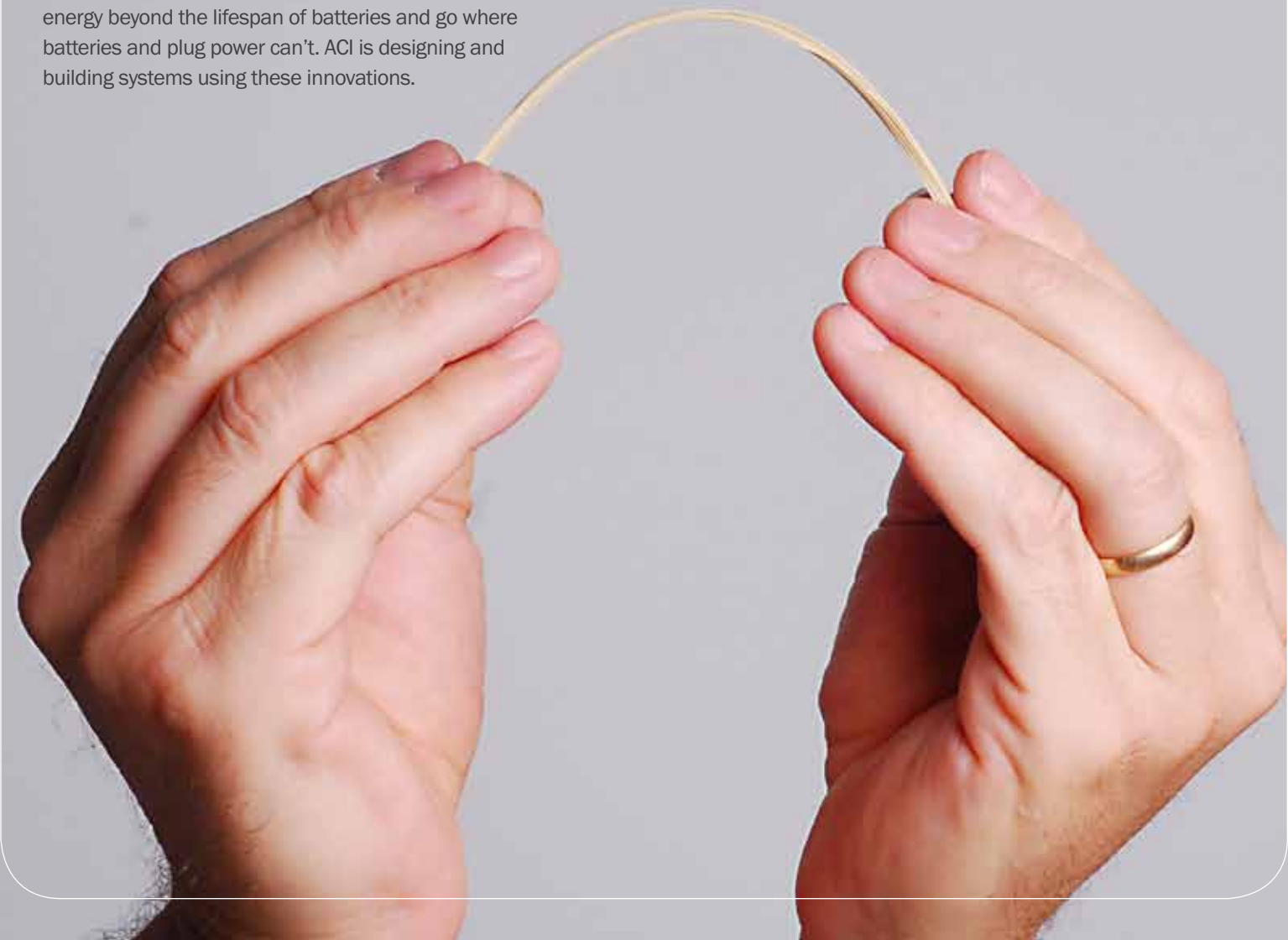
ACI has manufactured traditional ceramics since 1947. In 1991, ACI invented and patented the Viscous Suspension Spinning Process (VSSP) to make ceramic fibers. ACI has leveraged its ceramic and fiber knowledge into a whole range of new products focusing on the advantages that ceramics, in flexible fiber form, can bring. Its new ceramic fiber products have surpassed the traditional ceramic products both in revenue and margin. ACI continues to maintain the core of its traditional ceramic manufacturing base while developing and constructing new ceramic fiber spinning lines and composite assembly operations.

## MISSION

Building on its historical and breakthrough technologies, ACI provides new solutions and a platform by generating green power from waste energy, inexpensively. This enables electronic devices to function with power sources, which can provide energy beyond the lifespan of batteries and go where batteries and plug power can't. ACI is designing and building systems using these innovations.

## TECHNOLOGY

ACI's patented VSSP fiber technology is based on well established fiber processes. The fiber process takes cellulose digested in a mixture of sodium hydroxide and water. The resultant material, viscose, is the basis for rayon, cellophane, sponges, and sausage casings. ACI loads the viscose with a high volume percentage of ceramic and spins it through microscopic holes into a bath of mild sulfuric acid. The acid/base reaction coagulates the cellulose with the ceramic, yielding a cellulose fiber that contains a high volume percentage of ceramic. The cellulose is then burnt away leaving a very dense ceramic fiber. With no change in the VSSP, nearly any ceramic can be made into fiber form; thus opening many markets with little or no additional process or product development necessary.



## TYPICAL PRODUCTS

### Energy Harvesting

ACI builds various forms of its piezoelectric fiber composites (PFC), which are generally used to scavenge waste mechanical energy and turn it into functional amounts of electricity. The PFC's can be easily installed and can use ambient energy sources (often as small as sound pressure) to perform functions totally free of outside sources of power or batteries. These inexpensive, lightweight devices will replace batteries in many locations. Where batteries are already installed, the energy harvesting PFCs can be used to keep the battery charged by using local sources of waste energy to supply power to the battery. Applications in hand-held electronics are enormous. The same basic devices are used to monitor the health of systems ranging from industrial and military to human.

### Self-Powered Active Structural Control in Sporting Goods

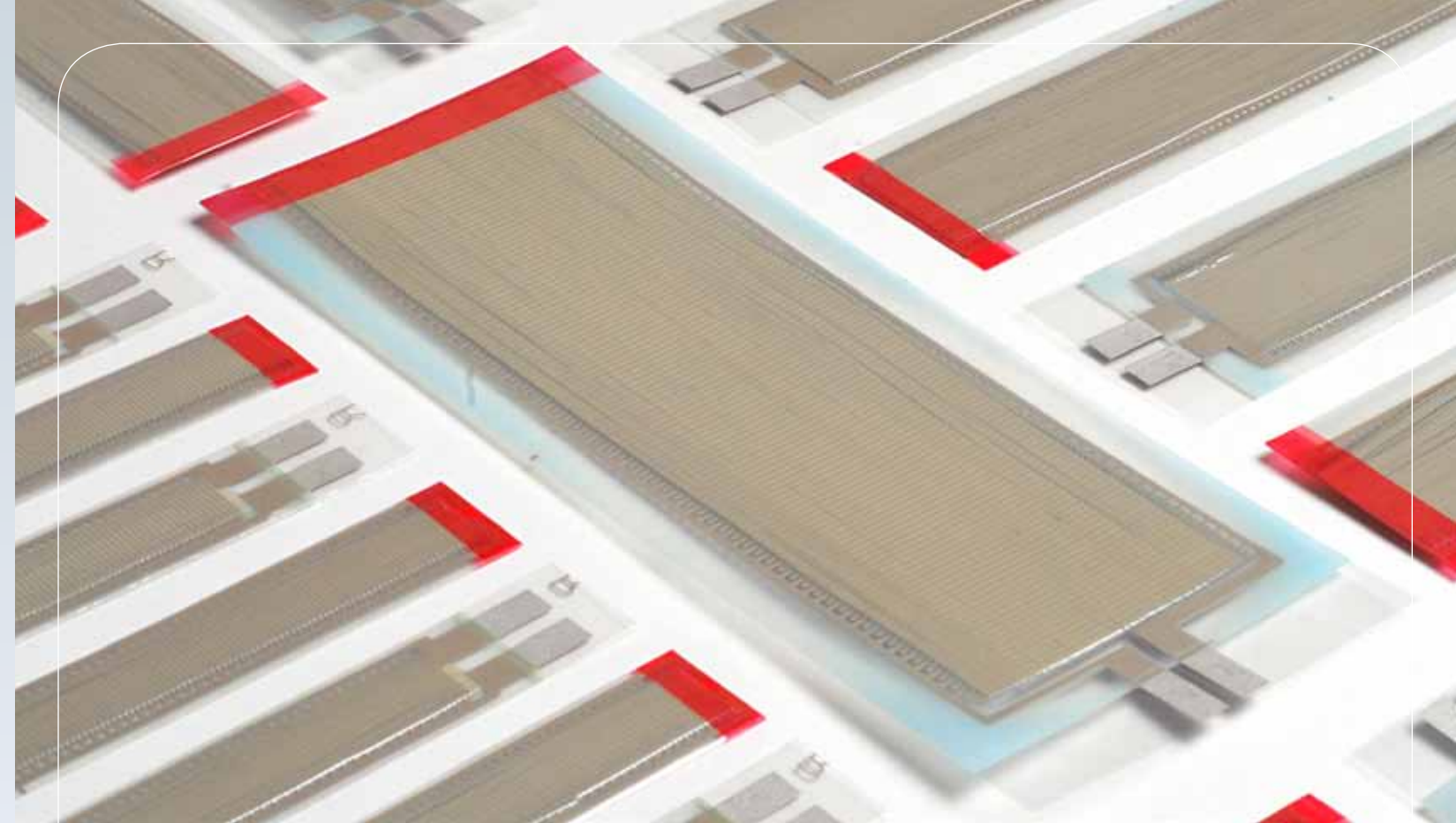
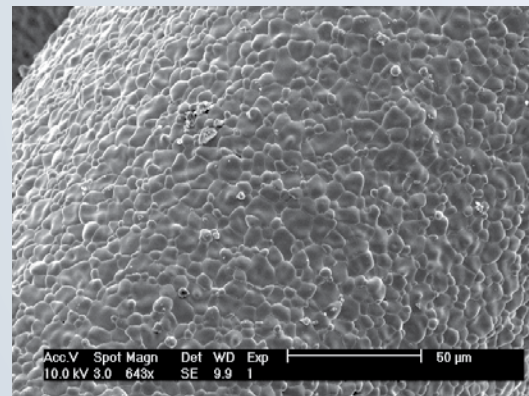
Originally developed to control the noise signature of helicopter rotors by actively stiffening the rotor to limit deflection. The piezo fiber composite technology evolved so that the same concept was marketed to sporting goods companies to actively control sporting goods to limit the effects of vibration. Sporting goods were chosen, initially, because their market has always been an early adopter of new technologies. The result is Head Sport's Intelligence and Protector lines of smart sporting goods where more than 3 million tennis rackets have been sold using ACI's piezo fiber technology. An important aspect is that the rackets have been clinically proven to prevent tennis elbow. The composites were also embedded in Head's smart skis and were initially used by the Austrian ski team, in the 2006 Winter Olympics, to win 2 gold and 1 silver medals. Current sport products using the technology include a new line of composite pool cues (Hamson, Int'l [China]) and Hockey sticks.

### Variable Diameter Ceramic Fiber Bone Cement Reinforcement

In cooperation with Los Alamos Lab, University of Notre Dame, and one of the largest U.S. producers of bone implants, ACI has developed a proprietary process to make variable diameter ceramic fiber (VDF) that significantly reduces fiber pullout in composite structures. When added to injectable bone cements, the biocompatible fiber addition provides a marginal increase in cement strength, but a more than 100 fold increase in fatigue strength.

### High Temperature Ceramic Composites for Next Generation Hypersonic Missiles

ACI has developed a new material (barium aluminosilicate-BAS) and a method to spin BAS fibers for missile leading edges that meets the electrical and thermal requirements of hypersonic missile radomes. Beside radome applications, these materials have broad use for any leading edge application ranging from shuttle tiles (next generation) to engine nacelles and fins. Eventual use of the material includes thermal barriers for furnaces and catalytic converter substrates.

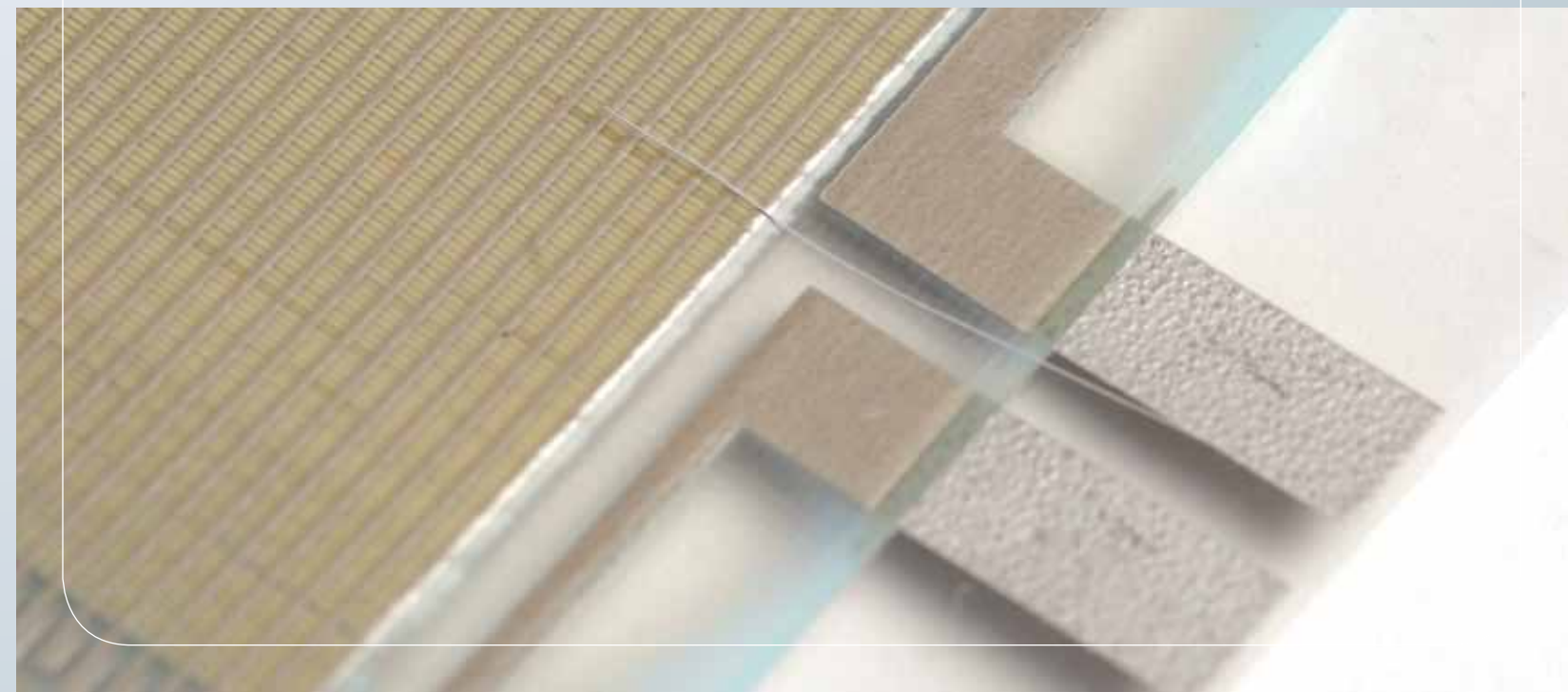


## CUSTOMERS

ACI has numerous customers for its ceramic fiber products. While many of them cannot be listed due to confidentiality constraints, notable among these as sizeable purchasers are Head Sport, Raytheon, Boeing, DoD, and Hamson International. Current development projects also include, but are not limited to, personal products and other sporting goods companies. ACI often develops its products with partners who hold leadership positions in their industries.

## PARTNERING/GROWTH

ACI is a profit oriented producer of goods with a goal to develop new materials and products that promote unique placement in various markets by providing product differentiation. ACI partners on the basis of joint development, licensing and/or equity participation. Further investment is sought to supplement funding through partnering.



## COMPANY PROFILE

Fortune Small Business Magazine recently named ACI as one of its “Hot Startups.” The company has received worldwide acclaim for its piezoelectric fiber composite energy harvesting and self-powered devices. ACI is building on this advantage in combination with its historical technologies and products to create a new entity that is a reinvention of itself. Using its proprietary fiber technology, ACI has self-powered piezo fiber based systems that can sense the health of a structure (e.g. a ship or aircraft) and use the activity being sensed as the source of power to transmit a wireless data signal to a central analytical location. This is all accomplished without the need for batteries or power cabling. ACI is using this technological edge to create a line of new products, not seen before, that solve a range of technical problems for both the military and industry.



At its corporate and R&D headquarters in Lambertville, NJ, ACI has 20,000 square feet devoted to manufacturing, R&D, and administration. In addition, ACI is in the process of expanding its composite and electronic assembly operations to a new facility in Findlay, Ohio where it has 20,000 square feet of clean room space. ACI is ISO-9001 certified and uses this to unify its production techniques to further lower costs while opening the door to customers who require such certification.

## MANAGEMENT TEAM

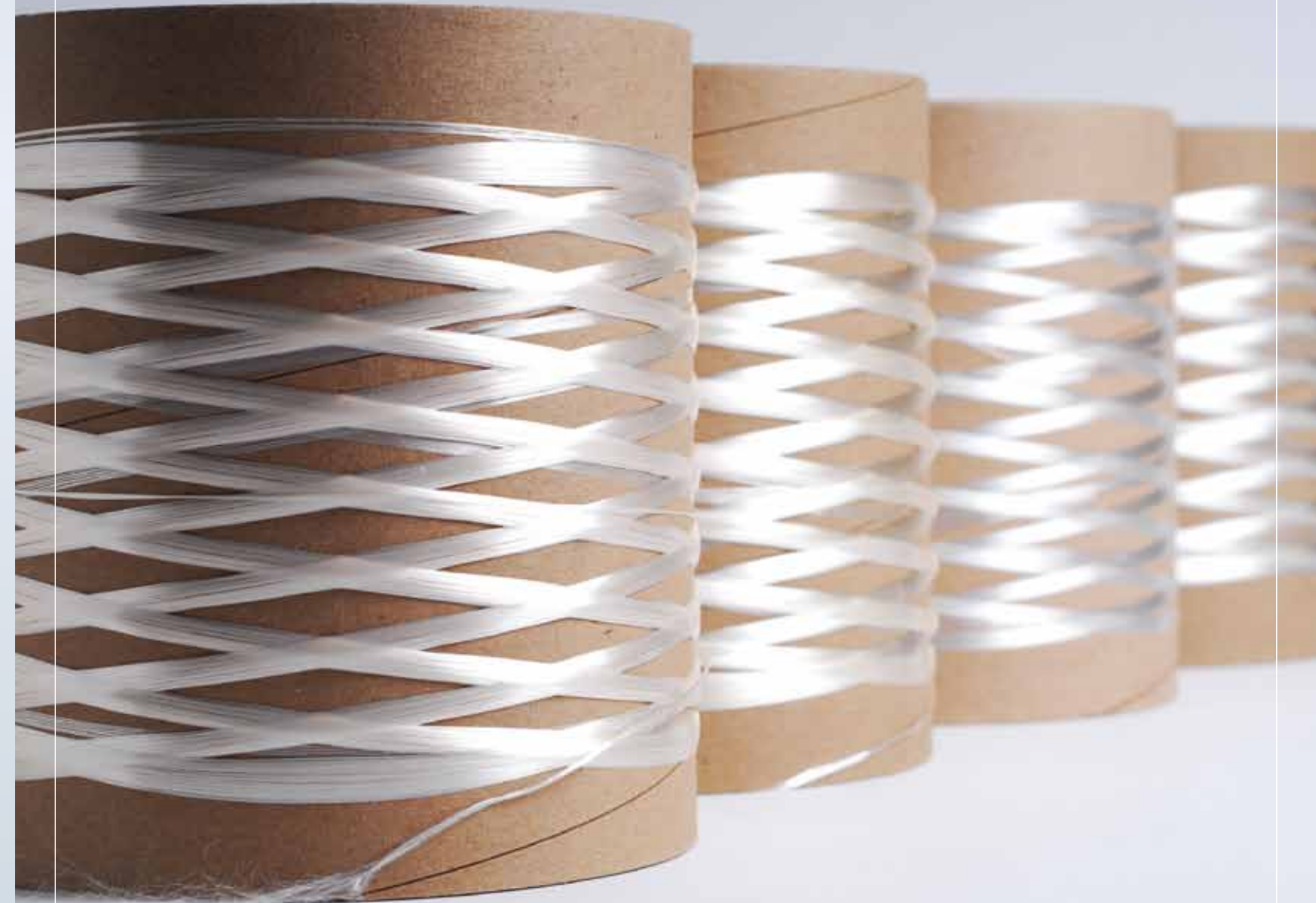
**Mike Hendricks**, Mr. Hendricks has been active as Vice President of Manufacturing and VP of Operations since 1984. Mr. Hendricks has a strong background in ceramic manufacturing and has been instrumental in optimizing production processes for ceramic components, ceramic fibers, and manufactured products. He has a business management background from Rider University and studied Electronics and Manufacturing Engineering at New Jersey Institute of Technology. Mr. Hendricks has been appointed to the New Jersey Department of Transportation Aviation Advisory Council. He has served as a Director for Advanced Cerametrics Inc, Lambertville Ceramic Manufacturing, HiTc Superconco and The Mid-Atlantic Aviation Coalition.

**Farhad Mohammadi**, Ph.D., serves as the Director of Research and Development and a Member of the Executive Committee. Dr. Mohammadi received his Doctorate in Materials Engineering from Rutgers University following 2 Master's degrees (Rutgers and the University of Florida) in Materials Science and Engineering. He received his bachelor's degree in Materials Science and Engineering from the University of Science and Technology of Iran. He joined ACI on May 2001 and since worked as a senior research scientist and later as the Director of Research and Development and has worked on numerous projects in the field. He has served as the principal Investigator for numerous DOD funded projects including “Energy Harvesting For Wireless Network Systems” and “Radomes For Hyper Speed Missile Radomes”. His research interests include piezoelectric energy harvesting, advanced structural ceramics, piezoelectric composites, and sensors and actuators. He is a member of The American Ceramic Society (1993-present), Materials research Society (1995-present), Ultrasonics, Ferroelectrics and Frequency Control Society of IEEE (1993-present), and The Ceramic Association of New Jersey (1998-present). He has 3 patents and has been published in numerous peer-reviewed journals.

**John Sfondrini**, serves as the Managing Director and a Member of the Executive Committee. Mr. Sfondrini graduated from the Wharton School of the University of Pennsylvania in 1970, and is the managing partner of the Edge Group, based in Ridgefield, Connecticut. Edge is an early stage venture capital firm formed in 1987. Since 2001, Edge has sought to invest in high growth companies, whose products have a distinctive technological advantage, funding ten companies for approximately \$30MM. During the late 80's and early 90's Edge Group focused solely on oil and gas exploration, funding numerous ventures for approximately \$40MM. Edge often leads the first institutional investment equity round for a company and brings high levels of value to its company partners through its strategic relationships and affiliations.

## MARKET EDGE/COMPETITIVE ADVANTAGES

ACI has numerous patents protecting its IP that are supplemented by many layers of proprietary processes. Where appropriate, ACI has acquired license rights to key technologies. ACI's continual presence in the press has helped to spread the word about its products and technologies. ACI's processes create significant barriers to entry in that the fiber technology requires not only the ability to spin rayon fiber but also the ability to understand and produce advanced ceramics. Only ACI has the technology to combine these abilities. The technology has been described as disruptive, since it is obvious once it is understood. It has also been referred to as a platform technology because so many other technologies are made possible by the ability to make nearly any ceramic into fiber form. A Wall Street analyst described ACI's technology as being like the early Intel, where there were only a few products, but thousands of uses. The key to the success of ACI's fiber technology is that its core is based on rayon, which has been around for over 100 years and is very inexpensive.





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