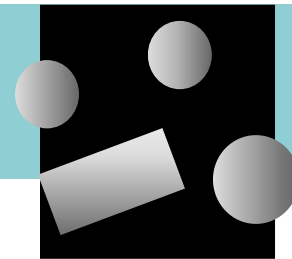


# TDA Research, Inc.



## AT A GLANCE

Established in 1987

Employs 65 people, including 60 scientists and engineers

\$10 million annual revenue

## OUR BUSINESS

Perform contract R&D

Patent inventions (63 current and pending patents)

Commercialize technologies by

- Internal business units
- Spin-off companies
- Licensing agreements

## FOR ADDITIONAL INFORMATION

Please contact:

John D. Wright  
Vice-President

Phone: 303-940-2300  
Fax: 303-422-7763  
[jdwright@tda.com](mailto:jdwright@tda.com)



## OUR COMPANY

TDA Research, Inc. was founded in 1987 and is located in Wheat Ridge, CO. TDA's staff of chemists and engineers develops catalysts, sorbents, advanced materials and hardware components. Our development work is primarily supported by U. S. Government R&D contracts. TDA retains the intellectual property developed under these contracts, and works in partnership with larger manufacturing companies to bring our products to market. In the past three years we have brought three product lines to market. In partnership with companies that are leaders in their fields, we have successfully commercialized the large-scale manufacture of fullerenes and our Direct Oxidation process to remove and recover sulfur from natural gas. Our Aedotron™ and Oligotron™ lines of conducting polymers are sold both directly and through Sigma-Aldrich.

## RESEARCH

TDA develops new materials, chemical processes and components. Our new materials include catalysts and sorbents, fullerenes and carbons, polymers and polymer additives and ceramics. These materials in turn often form the basis for unique chemical processes, or protect users from chemical hazards. Components include single use devices and aerospace propulsion and life support equipment.

**Catalysts:** We have developed room temperature catalysts that remove carbon monoxide from air, and high temperature catalysts that destroy pollutants such as sulfur compounds, ammonia and nitrogen compounds, and hydrocarbons and halocarbons. Other families of catalysts selectively oxidize hydrogen sulfide to either elemental sulfur or sulfur dioxide and form the basis of our low cost sulfur recovery processes for the oil and gas industry. Other catalysts enable the more efficient and less expensive manufacture of syngas and hydrogen, aldehydes and nitrotoluenes.

**Sorbents:** Our high temperature, chemically reactive fixed bed and fluidized bed sorbents have high capacity, superb physical properties, and can be cycled thousands, and often millions of times without degradation. One family removes pollutants such as sulfur and heavy metals such as mercury and arsenic from gasified coal. Other sorbents remove mercury or NO<sub>x</sub> and SO<sub>x</sub> from the flue gas leaving coal fired power plants. Two other families of sorbents transfer oxygen or CO<sub>2</sub> at high temperatures, and can be used to greatly reduce the cost of producing hydrogen or syngas. These sorbents can also be used in chemical looping combustion to produce electric power and produce or sequester CO<sub>2</sub>. In addition, we have developed sorbents that produce pure oxygen for chemical process use.

TDA Research, Inc  
12345 West 52<sup>nd</sup> Ave, Wheat Ridge, CO 80033

**Fullerenes and Carbons:** TDA developed the process used to manufacture the vast majority of the world's fullerenes. Our scientists are pioneering the separation and use of the plentiful but so far unexplored higher and giant fullerenes, as well as the use of endohedral and derivatized fullerenes in medical and imaging applications.

Our low-cost porous carbons have bimodal pore size distributions that provide high capacities and rates in liquid phase electrode applications such as ultracapacitors, fuel cells and capacitive deionization (desalination).

**Polymers:** Our polymer research focuses on electronic materials, self-assembling materials with nanoscale features, and nanoparticle additives. Our Aedotron™ products are conducting block copolymers that are dispersible in organics and form transparent thin films, which opens up new avenues for device manufacture. Our Oligotron™ products are conducting triblock oligomers that combine electrical conductivity with the ability to be printed from organic solution and polymerized to form patterned conducting features. We make polymeric materials that self assemble into structures with well-defined nanometer scale pores that can be used to make size selective membranes, shape selective catalysts or lithium battery electrolytes. Our nanoparticle additives can significantly improve the properties of a polymer at levels as low as a few percent. TDA's nanoparticles improve the corrosion resistance and mold resistance of paints, provide smooth yet non-skid coatings, and modify the glass transition temperature, physical and barrier properties of bulk polymers.

**Chemical and Biological Defense:** Combining elements of our expertise in catalysts and polymers, TDA is a leader in Chem/Bio defense, developing chemical agent resistant and self decontaminating coatings, fabrics and filters, and decontamination systems.

**Ceramics:** We are developing specialty aluminas, spinels and silicon carbides, and methods for inexpensively joining silicon carbides.

**Components and Devices:** TDA has developed and is commercializing a variety of components and devices, including single-use devices, life support equipment, fuel systems and microelectromechanical (MEMS) based devices. Single-use devices include units that heat individual servings of food or personal care items, and devices that sterilize medical instruments. TDA has built a variety of advanced life-support equipment for NASA, including air-revitalization systems, radiators and advanced heat pipes. TDA has built a flight qualified emergency oxygen generator for the International Space Station.

TDA has a long history in aerospace fuel systems, particularly in the cooling of hypersonic vehicles (endothermic fuels). We have developed catalytic, initiator driven and thermally driven systems, and have developed high performance heat exchangers. We have developed a detailed understanding of fuel system coking and fouling, and methods to control it. We are also developing fuel system components for advanced engines, including MEMS-based fuel injectors and combustion stabilization systems.

**WE LOOK FORWARD TO WORKING WITH YOU**

## OUR PRODUCTS

TDA's reactors make up the heart of Frontier Carbon Corp's 40 ton per year **Fullerene** plant in Kitakyushu, Japan. TDA built and licensed all of the reactors in this groundbreaking plant.



TDA's **Direct Oxidation** plants for the partial oxidation of H<sub>2</sub>S to elemental sulfur are being marketed to the oil and gas industry by M-I SulfaTreat and built by Westfield Engineering.



TDA's transparent conducting **Aedotron™** polymer (left) and our polymerizable **Oligotron™** electronic materials (right) are both soluble in solvents.

