

## Archived News

### Advanced Fuel Research, Inc.

## 2005

### July 2005

The AFR/NASA Ames paper entitled "A hybrid pyrolysis / oxidation system for solid waste resource recovery" was selected for publication in *SAE 2004 Transactions Journal of Aerospace* as one of the most outstanding SAE technical papers of 2004. The paper was originally published at *Proc. 34th Int. Conf. on Environmental Systems (ICES)*, Colorado Springs, Colorado, July 19–22, 2004, SAE technical paper No. 2004-01-2380, SAE International, 2004.

### March 2005

United States Patent #6,869,580, "Pyrolysis-Based Fuel Processing Method and Apparatus," issued to AFR. This invention is concerned with a method for generating a hydrogen-rich gas stream from hydrocarbon fuels. The inventors were Dr. Marek A. Wójtowicz, Dr. Michael A. Serio, Mr. Erik Kroo, and Dr. Eric M. Suuberg.

### February 2005

Advanced Fuel Research, Inc. celebrated its [25th Anniversary](#) on February 18, 2005. The company was started in 1980 by Dr. Peter R. Solomon, Dr. David G. Hamblen, and Mrs. Sally Solomon. The original goal for AFR was to create an instrumentation company to service the rapidly growing synfuel industry. Over the past 25 years, AFR. has been a leader in research and technology development and continues to develop new technologies in engine emission measurements, carbon materials, biomass pyrolysis, thin film materials and auxiliary components for fuel cells. Among its accomplishments, AFR has spun-off the [MKS On-Line Products Group](#), (a designer and manufacturer of leading edge semiconductor wafer and thin film metrology tools and multi-gas analyzers) and [Real-Time Analyzers, Inc.](#) (RTA), which is employing Raman spectroscopy in their line of chemical analyzers. Applications range from process control in polymer manufacturing to analysis of drugs in saliva. On behalf of Advanced Fuel Research, Inc. we would like to extend our thanks and appreciations to all involved in making the past 25 years a success.

## News & Events

### 2004

#### November 2004

Successful pilot-scale testing was performed at Metso Minerals Corporation, Danville Pennsylvania, using AFR's technology for producing virgin carbon black from oils derived from waste-tire pyrolysis. This work was performed under EPA SBIR funding received to develop a pyrolysis-based concept for waste-tire utilization.

#### October 2004

AFR is notified that it will receive a patent for its invention "Pyrolysis-Based Fuel Processing Method and Apparatus." This invention is concerned with the extraction of hydrogen from diesel fuel and other liquid fuels, a key enabling technology for the "Hydrogen Economy."

#### August 2004

AFR receives a DOE Phase I SBIR Award titled "Carbon Dioxide Recovery from Combustion Flue Gas Using Carbon Supported Amine Sorbents." This project will investigate the use of novel sorbent materials to remove CO<sub>2</sub> from smoke stacks.

#### July 2004

- Dr. Michael Serio presented the paper "Kinetics of Methane and Tar Evolution During Coal Pyrolysis" at the 30th International Symposium on Combustion held at the University of Illinois, Chicago (July 25-30, 2004). This paper is the latest in a series of more than 50 papers that AFR has written on the kinetics of coal pyrolysis over the past 25 years.
- Dr. Michael Serio presented a paper at the 34th International Conference on Environmental Systems (Colorado Springs, CO, July 19-22, 2004) titled "A Hybrid Pyrolysis/Oxidation System for Solid Waste Resource Recovery." This paper was a joint effort with the NASA Ames Research Center in Moffett Field, CA.
- Dr. Wójtowicz presented two papers at the Carbon 2004 conference held at Brown University, Providence, RI, July 11–16, 2004. Dr. Wójtowicz also served on the Scientific Committee of the above conference. The presented papers are entitled "Carbon Black Derived from Waste Tire Pyrolysis Oil," and "Activated Carbon from Waste Tires for Mercury Emissions Control." The work reported in these papers was performed under EPA SBIR funding received by AFR to develop a pyrolysis-based concept for waste-tire utilization.

## News & Events

### June 2004

AFR receives a contract from the National Academy of Sciences titled “Detection of Radioactivity in Transit Stations.” This project will be based on a concept called REDSTAR™ (Radiation Event Detection System: Track and Recognition) developed by Dr. Eric Rubenstein of AFR. During this month, the REDSTAR™ concept was also selected for the FastTrack program by the Connecticut Technology Council.

### May 2004

AFR receives a USDA Phase I Award titled “Processing of Poultry Manure for Fuel Gas Production.” This project will continue work on the utilization of poultry manure as a source of energy for distributed power generation.

## 2003

### November 2003

AFR receives two NASA Phase II SBIR Awards. The first award, titled “A Hybrid Pyrolysis/Incineration System for Solid Waste Resource Recovery” continues AFR’s development work on using pyrolysis processing for solid waste recycling in a Controlled Ecological Life Support System (CELSS). The second award, titled “Carbon-Supported Amine Sorbent Monoliths for Carbon Dioxide Removal” will continue AFR’s work on the development of novel sorbents for air revitalization in space.

### September 2003

- U.S. Patent No. 6,626,981 entitled “Microporous Carbons for Gas Storage” was issued to AFR. The subject of this invention is the method for producing highly microporous sorbents for hydrogen and other gases. Hydrogen storage is a critical barrier to the large-scale implementation of fuel-cell systems.
- Dr. Marek Wójtowicz was elected Chair of the Division of Fuel Chemistry, American Chemical Society. The ACS Division of Fuel Chemistry provides a forum for documentation and communication to the international community of research and development results, in order to promote efficient and environmentally acceptable fuel production and use.



*Fuel research and development  
for the 21<sup>st</sup> Century*

## News & Events

### AUGUST 2003



Dr. Michael Serio has been named to the International Editorial Board of *Fuel* (The Science and Technology of Fuel and Energy)

### May 2003


At the 49th International Instrumentation Symposium in Orlando, FL, the Aerospace Industries Division of the ISA presented Mr. James Markham with the Major Charles Bassett III Outstanding Paper Award for "Instrument for Temperature and Condition Monitoring of Advanced Turbine Blades." The award carries a named endowment of \$1,000 to support an engineering college scholarship.

### 2002

#### September 2002

**Chinese Seminar** - Dr. Marek Wójtowicz was an invited speaker on Fuel Cell Gas Storage, Fuel Cell Diesel Fuel Preprocessing, and Coal Pyrolysis Modeling at Tianjin University, near Beijing, China.

#### August 2002

- At the Annual Meeting of the American Chemical Society, Dr. Michael Serio presented a paper "Pyrolysis Processing of Animal Manure to Produce Fuel Gases." Erik Kroo also presented a paper on "The Effect of Local Charge on Coal Reactivity Modeled with Single Large Polymer Macromolecule."
- Air Force Research Laboratory Headquarters publishes IMPACT story on the Portable MultiGas Analyzer [Download SBIR Impact Story](#) 

#### June 2002

AFR is profiled by the Connecticut Technology Council [Download AFR Profile](#). 

#### May 2002

- AFR Next Generation Energy Group ("Hydrocarbons") received a grant from the US Department of Energy for "High-Performance Carbon Materials for Ultracapacitors."
- AFR's Combustion Monitoring & Control Group ("TurboSense") received a grant from the State of Connecticut Office of Policy and Management for turbine sensor technology intellectual property development.

## News & Events

### February 2002

**Connecticut DEP Recognizes AFR for New Technology** - The State of Connecticut Department of Environmental Protection has recognized AFR for implementing important new environmental technology through the U.S. Department of Energy NICE<sup>3</sup> program.



*Pictured here at the recent media event are from left to right: The Honorable Lieutenant Governor of the State of Connecticut Jodi Rell, AFR Chief Executive Officer Jim Markham, DOE Office of Industrial Technologies Director Scott Richlen, and the State of Connecticut Department of Environmental Protection Commissioner Arthur Rocque, Jr.*

The NICE<sup>3</sup> Program (National Industrial Competitiveness through Energy, Environment, and Economics) has provided AFR the opportunity to place three new multigas combustion process monitors in industry for 12 month field demonstrations.

## News & Events

### 2001

#### December 2001

The Air Force Research Laboratory (AFRL), headquartered at Wright-Patterson Air Force Base (WPAFB), Ohio, featured AFR's emission analysis technology as a Technology Horizons Spinoff. AFRL is responsible for the Air Force's annual \$1.2 billion science and technology program.

#### November 2001

U.S. Patent 6,322,613 issued to Dr. Marek Wójtowicz and Dr. Michael Serio for "Process for the recovery of mercury from a gaseous mixture": Adsorption of mercury on activated carbons derived from scrap tires enables the removal and recovery of mercury from combustion/incineration flue gas, with concurrent control of SO<sub>x</sub> and NO<sub>x</sub>

#### September 2001

AFR spin-offs Real-Time Analyzers, Inc., a firm specializing in advanced process Raman and surface enhanced Raman spectroscopy.

#### August 2001

AFR wins its fourth R&D 100 Award, for Surface-Enhanced Raman Spectroscopy.

#### July 2001

In collaboration with Brown University, a joint paper presentation at the 31st International Conference on Environmental Systems, Orlando, FL, "A Prototype Pyrolyzer for Solid Waste Resource Recovery in Space."

#### June 2001

In collaboration with Siemens Power Generation, a joint paper presentation at the ASME Turbo Expo 2001, New Orleans, LA, "Simultaneous Short and Long Wavelength Infrared Pyrometer Measurements in a Heavy Duty Gas Turbine."

#### April 2001

- AFR announced that its commercial spin-off company, On-Line Technologies Inc., was acquired by MKS Instruments in an agreement worth more than \$20 million. For more details, see [MKS Products Group](#)
- American Recycler reported on AFR's waste-to-energy technology development, "New Technologies for the Recycling of Waste Tires."



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### March 2001

AFR publishes Spring 2001 "Research and Commercial Update"  
Download PDF file - [News Letter March 2001.pdf](#) (70 kb)

### February 2001

Department of Energy, Office of Industrial Technologies, Energy Efficiency and Renewable Energy, published a Project Fact Sheet on AFR's collaboration with the Connecticut Department of Environmental Protection (DEP) for Continuous Emission Monitoring (CEM), "Combustion Project Fact Sheet: Energy-Conserving Tool for Combustion-Dependent Industries." Download PDF file - [advfuelrsh-factsheet.pdf](#) (93 kb).

### January 2001

- The Ballistic Missile Defense Organization (BMDO) featured AFR in its "BMDO Update" newsletter, in an article entitled "Make Way for Smaller, Cheaper Multigas Analyzers". Download pdf file [BMDO.pfd](#) (257 kb)
- AFR's commercialization success was featured in the corporate newsletter of Dawnbreaker (Rochester, NY), a professional services firm providing commercialization assistance to advanced technology firms and their investors.

## 2000

### December 2000

SAE's "Aerospace Engineering Online" reported on AFR's collaborative effort with DOE; Ohio Aerospace Institute (OAI); Wright Patterson AFB; Arnold AFB; NASA Glenn; Pratt & Whitney; General Electric; and Rolls-Royce - to develop a jet engine pyrometer.

### September 2000

- The U.S. Small Business Administration has awarded AFR the Tibbetts Award. Named after Roland Tibbetts, acknowledged as the father of the Small Business Innovation Research (SBIR) Program, this prestigious national award recognizes AFR as exemplifying the best in SBIR achievement (economic impact of technological innovation, business achievement, effective collaboration, and state and regional impact)
- National Aeronautics & Space Administration (NASA) publishes SBIR/STTR Success story on AFR's surface-enhanced Raman technology, <http://sbir.gsfc.nasa.gov/SBIR/successes/ss/9-028text.html>

## News & Events

### July 2000

AFR presents a paper at the 30th International Conference on Environmental Systems in Toulouse, France titled, "Pyrolysis Processing for Solid Waste Resource Recovery in Space."

### June 2000

- AFR presents two invited papers on combustion monitoring at the 21st AIAA Advanced Measurement Technology and Ground Testing Conference in Denver, CO. Paper AIAA 2000-2211 is a joint publication with Sverdrup Technology, Inc./AEDC of Arnold Air Force Base. Paper AIAA 2000-2212 is a joint publication with ABB Alstom Power Generation.
- AFR is invited and presents results of a DOE sponsored SBIR Phase I project on combustion monitoring titled "New Optical Coupling of Infrared Analyzers to Industrial Processes," to the DOE OIT Sensors & Controls Annual Meeting in Baltimore, MD.
- AFR completes a NASA Phase II SBIR project titled "Gas Storage Using Microporous Carbons." The objective of this project was to develop a method of manufacturing microporous carbon adsorbents for lightweight, high-energy density storage of gases. A prototype gas storage system was delivered to NASA under this project.
- AFR joined the National Institute of Standards and Technology (NIST) as a cooperative research partner to work on the Solid-State Imaging Infrared Polarimeter.

### May 2000

- AFR presents the Real-Time Analyzers (RTA) business plan to potential venture investors at a Department of Energy Dawnbreaker conference in Tysons Corner, Virginia. RTA will be a new independent spin-off of AFR sometime in 2001. The mission of RTA is to provide analyzers that perform continuous, real-time trace chemical detection with the ability to operate in harsh industrial environments. The initial products will employ Raman spectroscopy to measure chemical composition and will be targeted to serve the drug discovery and development markets.
- AFR is informed that it will receive an NSF SBIR Phase II award for the project "Whole Wafer Thermal Imaging for Real-Time Process Monitoring and Control." This is a collaborative project with FLIR and On-Line Technologies.
- AFR begins the DOD/AF SBIR Phase I project "Control Sensor for Turbine Engine Augmentor Rumble & Screech," which will involve a novel sensor system developed by AFR to detect incipient combustion instabilities in jet engine afterburners. A field test will be performed at an AEDC propulsion test facility at Arnold Air Force Base, TN.
- AFR is informed that it will receive a DOC SBIR Phase I award for the project "A Fast Scanning FT-IR Emission/Transmission Spectrometer for Spray



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Combustion Diagnostics." An FT-IR spectrometer system will be developed based on the On-Line Technologies, Inc., fast scanning interferometer system which can operate in the noisy environment of spray combustion systems. A field test will be performed at NIST in Gaithersburg, MD.

- AFR presents a paper on radiation thermometry at the 46th International Instrumentation Symposium in Bellevue, Washington.
- AFR completes a successful two-week field test/demonstration of a novel instrument for measuring the temperature of high-speed turbine blades in gas turbine engines with Siemens KWU in Berlin, Germany. This work was done under a DOE SBIR Phase II program.
- AFR begins a DOE sponsored NICE3 project for combustion monitoring with the Connecticut DEP as the State Sponsor. Industrial cost-sharing partners in the project are Pratt & Whitney, Air Pollution Characterization and Control, Northeast Generation Services, and On-Line Technologies.
- AFR delivers an FT-IR multi-gas analyzer prepared for turbine engine gas analysis to AEDC at Arnold Air Force Base. This prototype product that utilizes a new fast response long effective path gas cell was developed during an DOD/AFR sponsored SBIR Phase II project.

### April 2000

- AFR is an invited participant in a NASA workshop held in Houston, TX on Waste Processing and Resource Recovery for Advanced Life Support.
- AFR hires Mr. Ken Wexler as Director of Business Development. Mr. Wexler will focus on the commercialization of AFR's technology. He has more than 16 years of experience in Senior marketing and sales for worldwide manufacturer of computer hardware, chemicals, plastics, pulp & paper, and industrial equipment. He holds an M.A. in Chemistry from Columbia University and an M.B.A. from Rensselaer Polytechnic Institute.
- On-Line Technologies, Inc. (OLT), an AFR spin-off, recently recorded its second profitable quarter in a row accompanied by increasing revenue growth. OLT is manufacturing and marketing gas-state sensors, wafer-state sensors (for the semiconductor industry) process control software and thin film monitors based on AFR-developed technologies. It recently introduced the FilmExpert™ Advanced Film Analyzer and the first unit was delivered to Lucent Technologies. Orders for two additional units have been received. A Series 2010 Multi-Gas Analyzer was recently sold to Intel.

### March 2000

- AFR makes a presentation at the NASA Ames Center on its Phase II SBIR project titled "Pyrolysis Processing for Solid Waste Resource Recovery in Space."
- AFR officially introduces two new products, the "Industrial Raman Analyzer" and the "Surface Enhanced Raman Spectroscopy (SERS)" sample vials at the 2000 Pittsburgh Conference on Analytical Instrumentation. The Industrial Raman

## News & Events

Analyzer has been designed specifically for chemical process monitoring and control in production facilities. Fiber optic probes allow for in-situ, in-line, or at-line measurements. The SERS vials can be used to significantly enhance the Raman signals for certain compounds, in some cases by a factor exceeding 106. These vials are suitable for numerous applications in the biochemical, biomedical, chemical, drug enforcement, environmental, forensics, and pharmaceutical fields.

- AFR supports the EPA Region 1 Accessing Federal Resources Workshop (Boston) by providing a presentation to less experienced small businesses. "Collaborations of a Small Business During SBIR Projects: The Good, The Bad, and The Ugly" was well received.
- AFR makes its second technology presentation to the SAE International Committee E-31. The committee is dedicated to providing industry with standard practices for emissions measurements from aircraft engines.
- AFR attends and makes a project presentation regarding combustion monitoring at the DOE NICE3 Commercialization Strategy Workshop in Albuquerque, NM.

### January 2000

AFR completes a field test/demonstration of a novel performance monitor for gas turbine engines with Pratt & Whitney in East Hartford, CT (EPA SBIR Phase I sponsorship). The prototype was installed in a turbine engine test cell and successfully performed in-situ gas composition measurements through the exhaust plume of an operating jet engine.

### 1999

#### December 1999

AFR completes a field test/demonstration of a novel instrument for measuring the temperature of gas turbine engine parts under development with ABB Alstom Power in Windsor, CT (DOE SBIR Phase II sponsorship).

**November 1999** AFR receives an NSF Phase I SBIR award titled "High Sensitivity Raman Spectrometer." This project will design and test a hybrid Raman spectrometer suitable for "on-demand" or continuous process monitoring. This will be accomplished by employing an innovative design which overcomes the limitations traditionally associated with Raman Spectroscopy.

#### October 1999

AFR received an award under the NASA SBIR program. The title of this Phase II project is "Pyrolysis Processing for Solid Waste Resource Recovery in Space." The objective of this project is to produce a prototype waste disposal unit for long term space travel based on pyrolysis processing. This work will be done in collaboration with Hamilton

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Sundstrand Space Systems International, Brown University and On-Line Technologies, Inc.

### September 1999

- AFR holds a broad range of presentations and discussions in Japan with Coal Utilization Japan (CCUJ), Kyoto University, and Osaka Gas Co., Ltd.
- AFR receives a DOD Navy Phase I SBIR award titled "Development of a Portable FT-Raman Instrument for Fuel Characterization." This project will develop a field instrument to assess stored, host nation or captured fuel supplies.
- Dr. Marek Wójtowicz, Manager of the Hydrocarbons Group at AFR, presents two papers at the Tenth International Conference on Coal Science, Taiyuan, China, 12–17 September, 1999. The papers are entitled "Yields of pyrolysis products for coals originating in different parts of the world," and "Gasification behavior of coal chars originating in different parts of the world." The research reported in the papers was performed at AFR under the Brain-C project funded by two Japanese agencies: The Center for Coal Utilization Japan (CCUJ) and the New Energy & Industrial Technology Development Organization (NEDO). The work was carried out under a subcontract agreement with Idemitsu Kosan Co., Ltd.
- AFR is informed that it will receive an award under the NASA SBIR program. The title of this Phase II project is "Pyrolysis Processing for Solid Waste Resource Recovery in Space."

### August 1999

- Dr. Marek Wójtowicz, Manager of the Hydrocarbons Group at AFR, was involved in the Organization and Chairmanship for a symposium entitled "Recent Advances in Fuel Cells" at the 218th ACS National Meeting, New Orleans, CA, 21-26 August 1999.
- Organization and Chairmanship, and presentation of a paper for a symposium entitled "Recent Advances in Fuel Cells" at the 218th ACS National Meeting, New Orleans, CA, 21-26 August 1999.
- AFR delivers a Fourier Transform Infrared (FT-IR) Emission/Transmission (E/T) spectrometer to Arizona State University. This system will be used by researchers in the Dept. of Mechanical & Aerospace Engineering as a diagnostic tool for research on combustion.
- AFR signs a research contract with a Fortune 500 company to develop a robust biomass-pyrolysis model.

### July 1999

- A paper was presented at the 24th Biennial Conference on Carbon, Charleston, SC, 11-16 July, 1999: Wójtowicz, M. A., Bassilakis, R. and Serio, M. A., "Char-oxidation reactivity at early and late stages of burn-off," Proc. Twenty-Fourth

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Biennial Conference on Carbon, American Carbon Society, Charleston, South Carolina, July 11-16, 1999, vol. I, pp. 230-231.

- AFR is informed that it will receive two awards under the EPA SBIR program. One is a Phase II titled "The Manufacture of Carbon Black from Oils Derived from Scrap Tires," and one is a Phase I titled "Gas Turbine Engine Performance Monitor for Reduced Emissions.
- Two-month evaluations of AFR/On-Line gas analysis equipment are underway. In mid-July, AFR delivered an MG-2010 Multi-Gas Analyzer to Arnold Air Force Base in Tennessee. A second is scheduled to go to Rolls Royce Allison in Indiana. Both will monitor turbine engine exhaust gas.
- AFR wins two Phase I awards under the DOE SBIR program titled "New Optical Coupling of Infrared Analyzers to Industrial Processes," and "Improved Carbon Molecular Sieve Membranes for Oxygen-Nitrogen Separation.
- AFR completes development of a first-generation prototype FT-Raman system with its affiliate, On-Line Technologies, Inc.

### April 1999

- AFR signed a commercialization agreement with United Carbon Corporation to develop a full-scale process for the manufacture of carbon black from oils derived from waste-tire pyrolysis.
- Research on AFR's technology was supported by the Environmental Protection Agency under the Small Business Innovation (SBIR) program.
- AFR receives an award for the outstanding paper presented at the American Chemical Society Division of Environmental Chemistry meeting in Boston, Massachusetts (August, 1998). The paper was titled "Microwave-Assisted Control of Nitric Oxide, Nitrous Oxide and Ammonia Emissions.
- AFR and On-Line are featured in an article in BMDO Update, a quarterly publication of the Ballistic Missile Defense Organization (BMDO) Technology Applications Program. The article discusses the evolution of On-Line as a spin-off from AFR based on technology developed with support from the BMDO, DOE, NSF, Air Force and other government and private sources.
- On-Line introduces a new product called the INDUCT™ analyzer which provides quantitative, simultaneous, rapid, in-situ determination of over 20 gas concentrations within the feed or exhaust line of process equipment. The system features a large dynamic range (low ppb to percent), under 1 sec. response time, temperature and pressure compensation and lifetime calibration.

### January 1999

- AFR receives an award for best poster presentation at the Gordon Research Conference on Hydrocarbon Resources held in Ventura, CA. The paper was titled "Hydrogen Storage Carbons Derived from Polyvinylidene Chloride (PVDC).

## News & Events

- Ms. Sally Solomon retired from AFR after 18 years as Office Manager and Director of Human Resources. She is being replaced by Ms. Susan White, who was promoted from being the Assistant Office Manager and Contracts Administrator. Ms. Solomon was one of the founders of AFR and will continue in her role as Secretary-Treasurer of the corporation and a member of the Board of Directors. In addition to her new duties, Ms. White will continue in her role as Contract Administrator.

## 1998

### December 1998

- AFR delivers a Fourier Transform Infrared (FT-IR) Emission/Transmission (E/T) spectrometer to the NASA Lewis Research Center. This spectrometer will be used as a diagnostic instrument for laboratory and microgravity combustion diagnostics.
- AFR participates as a finalist in the DOE/Dawnbreaker Commercialization Assistance Program. A business plan is presented for TurboSense, a company that will design, develop, manufacture, and market novel turbine engine performance and health monitors. The market will be manufacturers and end users of advanced gas turbine engines for electricity generation and propulsion.

### November 1998

AFR introduces its latest product, sample vials for Surface-Enhanced Raman Spectroscopy (SERS). A solution containing the sample is injected into vial which is placed in the sample compartment of a Raman spectrometer. A proprietary coating on the vial enhances the intensity of the Raman signal, in some cases more than a factor of  $10^6$ .

### October 1998

- Dr. Marek Wójtowicz, Manager of the Hydrocarbons Group at AFR, presented an invited keynote lecture at the Third International Conference on Materials Engineering for Resources (ICMR '98), Akita, Japan, 26-28 October 1998. The paper was entitled "Microporous carbon adsorbents for hydrogen storage."
- AFR receives two NASA SBIR Phase I Awards, "Study of Agent Effectiveness in Suppression of Aircraft Post-Crash Cabin Fires Using Advanced FT-IR Diagnostics" and "Pyrolysis Processing for Solid Waste Resource Recovery in Space."
- On-Line Technologies, Inc., an AFR spin-off that is also based in East Hartford, Connecticut has opened a Silicon Valley office to support both its customer base as well as development work taking place in the Western United States. Dr. Matt Richter has been hired as Applications Manager to oversee the new operations. On-Line is a manufacturer of optical sensors and Advanced Process Control

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systems. On-Line Technologies can be reached at [MKS On-Line Products](#) or 860-291-0719 in CT or 650-424-8559 in CA.

- On-Line introduces a new product, Process Sense™, a compact, low cost quantitative, in-situ sensor for determining gas composition within a production feed line, process equipment or exhaust gas line. This analyzer utilizes infrared absorption; changing filters is all that is requested to measure different gases.
- AFR receives NSF Phase I SBIR grants titled "Macroscopic and Molecular Interactive Simulations for Physical Science Education" and "Whole Wafer Thermal Imaging for Real-Time Process Monitoring and Control."

### August 1998

- For more information about AFR and our success with NASA see the [NASA SBIR/STTR Mail](#)  
AFR employees present three papers of the 27<sup>th</sup> Symposium (International) on Combustion held at the University of Colorado at Boulder. The titles were "Modeling of Biomass Pyrolysis Kinetics," "Prediction of Horizontal Flame Spread Using a Theoretical and Experimental Approach," and "Planar to Laser Induced Fluorescence Imaging of Crevice Hydrocarbon Emissions in a Spark-Ignited Engine."
- Dr. Marek Wójtowicz, Manager of the Hydrocarbons Group at AFR, presented a keynote lecture at the EUROCARBON '98 conference, Strasbourg, France, 5-9 July, 1998. The paper was entitled "Microporosity development in carbons for gas-storage applications."

### March 1998

- On-Line Technologies, Inc., an AFR spin-off will officially open its new manufacturing facility on April 30, 1998. This new facility will allow for increased production of On-Line's FT-IR spectrometers which are used for thin film characterization and gas analysis. For additional information, please visit [MKS On-Line Products](#).
- Agreements were reached with Dynamotive Corporation (Vancouver, BC) to continue testing their BioLime™ based technologies for SO<sub>x</sub>, N<sub>2</sub>O, and NO<sub>x</sub> control. The relationship with Dynamotive began in 1995 and has involved six separate projects.

### February 1998

- Dr. Michael Serio, President of AFR, gave an invited lecture titled "Modeling of Coal Pyrolysis Processes" at the International Symposium on Advanced Energy Technology in Sapporo, Japan (February 2-4, 1998).
- Dr. Marek Wójtowicz, Manager of the Hydrocarbons Group at AFR, gave two invited lectures at the Coal Research Center (CRC) Coal Chemistry Symposium, Sydney, Australia (February 16-18, 1998). One lecture concerned "TGA-FTIR

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Analysis of Coal," while the second was on the "FG-DVC Model of Coal Pyrolysis."

### January 1998

- An ACS (American Chemical Society) Symposium Series Volume titled "Synthesis and Characterization of Advanced Materials," was recently published by ACS Books as No. 681 in this series. The Senior Editor was Dr. Michael Serio, President of AFR, and this volume was based on a symposium that he organized for the Materials Chemistry Secretariat at the 1996 ACS Orlando National Meeting.
- **Dr. Peter R. Solomon**, CEO and President of AFR since its founding in 1980, stepped down to devote full time to being CEO and President of On-Line Technologies, Inc., an AFR spin-off. He was replaced by **Mr. James R. Markham** as CEO and **Dr. Michael A. Serio** as President, who were promoted from Vice-President/Chief Operating Officer and Vice-President/Chief Technical Officer, respectively. Dr. Solomon will continue to serve as Chairman of the Board of Directors. **Dr. David G. Hamblen** will continue to serve as Vice-President/Chief Financial Officer.

### 1997

#### December 1997

Efforts directed toward commercialization of AFR's FG-DVC model continue. Work is under way at the University of Leeds, UK on the integration of AFR's coal devolatilization model, FG-DVC, with the FLUENT Computational Fluid Dynamics (CFD) code, which is the most widely used code of this type in the world.

### 1996

#### June 1996

U.S. Army Space and Strategic Defense Command publishes story on AFR's rugged FT-IR spectrometers