DOE/PC/94063--T4

QUARTERLY TECHNICAL PROGRESS REPORT

AND KEY PERSONNEL STAFFING REPORT

NUMBER 4

**PRODUCTION AND SCREENING OF CARBON PRODUCTS
PRECURSORS FROM COAL**

CARBON PRODUCTS CONSORTIUM

CONTRACT NO. DE-AC22-95PC94063

REPORTING PERIOD:

October 1, 1995 to December 31, 1995

Submitted to:

**AAD Document Control Center
U.S. Department of Energy
Pittsburgh Energy Technology Center
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Submitted by:

**West Virginia University Research Corporation
on behalf of West Virginia University
617 N. Spruce Street
Morgantown, WV 26506**

January, 1996

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MASTER

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January, 1996

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Key Staffing Report

October 1, 1995 to December 31, 1995

Executive Summary

This quarterly report covers activities during the period from October 1, 1995 through December 31, 1995. The principal events concerning administration of the CPC were the December 12, 1995 Fall business meeting of the CPC and the general CPC review meeting on December 13, 1995. It is noteworthy that CONOCO, Inc. joined the CPC and that the CPC Board of Directors approved annual member fees to help support the CPC organization. Discussions have been initiated on licensing and joint venture arrangements to produce pilot-scale quantities of solvent extract coal pitches.

The technical emphasis continues to be the supply of coal-based feedstocks to the industrial participants. There have been several iterations of samples and feedback to meet feedstock characteristics for a wide variety of carbon products.

Technology transfer and marketing of the CPC is a continual effort. Interest in the program and positive results from the research continue to grow. In several aspects, the program is ahead of schedule, but continuation funding for the work of the CPC is a critical issue.

1.0 Project Planning and Administration

The purpose of Task 1.0 is to prepare and submit to the DOE, a Project Management plan for the WVU portion of the Carbon Products Consortium (CPC) workplan. This Management Plan was submitted to PETC on July 2, 1995. It has been accepted by the COTR and by the contracts management staff. Task 1.0 is complete.

2.0 Consortium Administration and Reporting

The purpose of Task 2.0 is to establish a Participants Agreement (PA) and a Proprietary Information Agreement (PIA) for members of the CPC, to facilitate communications between CPC participants and the COTR, and to help secure, maintain and manage CPC funds obtained under this contract.

The PA and the PIA were finalized on September 1, 1995. It was necessary to revise the PA to define the category of Affiliated Participant for an organization which does not sign the PA or the PIA, but is involved with the work of the CPC. A copy of the revised PA was included with Monthly Status Report No. 8, September 1, 1995 - September 30, 1995.

All monthly status and quarterly technical reports have been submitted as required by the contract. In addition to the required reports, regular communications with the COTR have been maintained.

Extensive discussions and efforts are ongoing to try to maintain funding for the CPC program. The university and industrial contracts have been established as three year programs; however, only one year of funding has been made available.

The CPC Participants Agreement establishes a Board of Directors with various duties and powers. The CPC Board of Directors met at WVU on December 12, 1995. The principal items of business were:

1. Designation of Board members and election of Chair and Vice Chair;
2. Admission of new CPC member;
3. Discussion of proprietary technology;
4. Discussion of licensing agreement;
5. Discussion of DOE sponsored workshop on carbon materials for lightweight, safe vehicles;
6. Approval of 1996 operating budget;
7. Approval of 1996 consortium member fees.

A detailed agenda and minutes of the Board meeting are included with the Monthly Status Report for December, 1995.

Subcontracts for the CPC industrial participants are administered through the Fossil Energy Materials Program office at ORNL. The industrial participants submit quarterly reports to ORNL. Copies of the most recent quarterly reports submitted by the industrial participants are included as attachments to this report.

3.0 Coal Extraction

Under Task 3.0 and subtasks, WVU will provide a variety of types and sizes of samples of coal extracts to the industrial and national laboratory participants. In addition, green and calcined cokes will be developed.

3.1 Supplying Coal Extracts and Cokes for Testing

3.1.1 Preparation of Coal-Derived Pitches

Details on the pitch preparation were presented in the last quarterly report. Based on the technical feedback from UCAR Carbon Company, all CPC members had been supplied with a variety of pitches, extracts, or cokes. However, Amoco is currently still evaluating the available data on the coal-derived pitch characteristics. It is expected that Amoco will soon make a selection as to which material to be evaluated.

3.1.2 Preparation of Green and Calcined Cokes

In consultation with Alcoa, three different coal-derived extracts were chosen for conversion into green and calcined cokes. The table below identifies what the materials are.

Table 1. Pitches and Cokes Derived from WVGS 13423 Coal

Parent Pitch	Green Coke ID	Calcined Coke ID
Extract from raw coal	C017	A158
Extract from 400°C, 1 hour coal hydrogenation.	D075	A159
Extract from 450°C, 1 hour coal hydrogenation.	D074	A151

Green cokes were prepared by placing about 500g of coal-based precursor into a plain steel reactor vessel. A lid was attached to the reactor body and the entire vessel inserted into a temperature programmable box furnace. The contents were converted into green coke under atmospheric pressure by heating from room temperature to 500°C at a rate of 3°C/min, and held at 500°C for two hours. The coker reactor was then cooled slowly to room temperature and the coke removed and weighed.

Calcined cokes were prepared by placing green coke into an alumina crucible and covering with a lid. The crucible was then placed into a larger crucible and completely buried with coke breeze to prevent oxidation by air. The system was then placed in a programmable box furnace and heated from room temperature to 1000°C for 90 minutes. The furnace was allowed to cool to room temperature slowly and the calcined coke recovered and weighed.

4.0 Technical/Economic Evaluation of WVU Extraction Process

WVU provided all requested information to the MITRE Corporation for their economic analysis of the coal extraction process. A draft of the MITRE report was received in mid July, 1995 and a revised version was received in September, 1995.

The MITRE report suggests several process changes whose implementation on a larger scale could substantially reduce the cost of the coal extraction process. MITRE finds that coal extract based calcined coke for anodes could be produced for approximately \$177 per ton. This is very promising since petroleum based calcined coke is already over \$200 per ton in Europe and will soon exceed that amount in the United States. MITRE also recommends research on the production of isotropic carbon fibers from coal extracts of unhydrogenated coal. Such fibers are in the \$8 to \$10 range and the market is expected to double in the near future.

5.0 Technology Transfer

During the reporting period there have been several technology transfer sessions. Some are listed below:

Ron McHenry of Koppers presented a paper entitled, "Coal-Tar/Petro Binder Studies" at the **Australasian Aluminum Smelter Workshop** which was held in Sydney, Australia the week of October 23, 1995. Koppers work on blended binders is especially interesting for the CPC because of the possibility of blending coal-tar and solvent extract pitches for use in the aluminum industry.

Irv Lewis and Rick Lewis met with the WVU research group on October 23, 1995 at WVU to discuss UCAR's most recent analysis of WVU coal-derived pitches.

The six CPC Participants have sent letters to US DOE Secretary Hazel O'Leary emphasizing the value of the work and the need for continued funding of the CPC. (ALCOA's letter went to Assistant Secretary Marvin Singer.) Copies of these letters are attached to this report.

On December 6, 1995, Carl Irwin met with Jim Eberhardt and Sid Diamond of the US DOE Office of Transport Materials to discuss plans for a workshop to assess the role of carbon products in automotive systems of the future.

The CPC Fall Meeting was held at WVU on December 13, 1995. All CPC participants except FMI attended the meeting. Other organizations represented include PETC, METC, the WV Development Office, Senator Rockefeller's Office, and several WVU offices and departments. WVU President David Hardesty welcomed the group to WVU. He said the CPC has a high priority within the university and is an outstanding example of a university, industry, government partnership on applied research which could benefit economic development in the state. A copy of the meeting agenda and a hard copy of transparencies used in presentations is included with the Monthly Status Report for December, 1995.

The WVU research group will present a paper at the **20th Annual Conference on Composites, Materials, and Structures** held January 23-25, 1996 in Cocoa Beach, Florida.

ATTACHMENT 1

**Quarterly Reports submitted by CPC
Industrial Participants
to Fossil Energy Materials at ORNL**

QUARTERLY MANAGEMENT REPORT

DEVELOPMENT OF PRECURSOR FOR PRODUCTION OF GRAPHITES AND CARBON PRODUCTS

Subcontract 62X-SR928C-UCAR-3

October 1, 1995-December 31, 1995

by

I. C. Lewis

UCAR Carbon Company Inc.

Technical Highlights

UCAR 3-1 Screening of Coal Extracts

We fully characterized larger-scale (300 gm) extracts prepared from two different coals hydrotreated at 450°C for 1 and 2 hours. The 2-hour samples gave better properties in terms of suitability for needle coke and precursors for mesophase pitch fibers. The WVGS 13421 bituminous coal extracts were superior in these respects, and the more hydrotreated material was recommended for further scaleup. All the extracts showed high N and O levels (~ 2-3% for each). However, they formed large domained mesophase ranging in size from 80 to 270 μ m.

We also characterized the toluene insoluble portion of one of the extracts which had been subjected to a second 450°C hydrogenation. The mesophase formation was monitored on the hot-stage microscope using a video attachment. The material developed some mesophase rapidly through physical distillation and eventually developed very large domained mesophase believed suitable for high-performance fibers. This mesophase development occurred despite a high precursor oxygen content of 1.9%. As far as we are aware, no other coal conversion process had produced such a quality material.

We have therefore demonstrated the potential for using the coal hydrogenation/extraction process for producing the wide range of carbon materials encompassed by the consortium members.

UCAR 3-2 Activation of Coal Extract Residues

We prepared 3 activated carbons produced by H₂O activation of coal extraction residues at 900°C. The materials were prepared to achieve burn-off levels ranging from 32-50%. Samples of each of the carbons were sent to both ORNL and WVU for surface-area measurement and characterization. Results have been received from WVU and the data indicate a maximum surface area of 447 m²/gm at 50% burn-off. Ash analysis of the active carbons show they typically contain between 4-5% ash.

UCAR 3-3 Preparation of Graphite Artifacts

We have not prepared any graphite artifacts from coal extract materials because large samples of calcined coal extract coke and coal extract pitch have not yet been provided from WVU.

UCAR 3-4 Meetings and Consultation

A meeting was held at WVU on December 13, 1995, to review our evaluation results for the Consortium Team members. We recommended scaleup of the hydrotreated WVGS-13421 Coal (450°C - 2 hrs.) extract for evaluation as a pitch and mesophase fiber pitch precursor. The less-hydrotreated samples should be suitable as precursors for anode coke.

Issues

The WVU Group is exploring ways in which they can coke and calcine large quantities of coal extract to provide samples of coke for evaluation by UCAR for graphite fabrication. Our completion of this latter objective will depend on their success in supplying materials.

KOPPERS INDUSTRIES, INC.

QUARTERLY MANAGEMENT REPORT**KEY TO MAJOR MILESTONES****Task 1 (First Year) - Techniques for Converting Selected Solvent-Extracted Materials into Usable Pitches and Cokes**

- 1.1 Review processing and materials produced at West Virginia University (WVU).
- 1.2 Select samples to be evaluated as binder and impregnating pitches, cokes, plasticizers, and chemicals.
- 1.3 Perform detailed analyses on samples.
- 1.4 Perform thermal analyses on selected samples.
- 1.5 Perform coke characterization on selected samples of by-products.

TECHNICAL HIGHLIGHTS

Three initial coal-extracted samples were received from WVU. Analyses were performed on these small samples (see attached Table). The results were studied and summarized at the Annual General Carbon Products Consortium Meeting at WVU on December 13, 1995. We believe that all three samples should be coked and characterized for potential application study. Samples "2" and "3" have potential application in some binder applications; however, the high oxygen and nitrogen content may limit usage in any premium products. Binder modification and application must be studied in future milestones. In fact, we must consider milestone deviations in our Task 1.

Table 1: Analyses of Three Samples from WVU

Sample	1	2	3
	Solvent Extracted Residue from Coal	Hydrogenated Sample 1	Toluene-Extracted Material from Sample 2
SP, °C	NA	119.2	112.8
TI, %	92.7	11.5	1.3
QI, %	2.4	0.5	0.02
BR, %	90.3	11.0	1.28
SpG	1.272	1.206	1.217
Ash, %	.25	0.07	0.0
CVC, %	NA	50.7	44.8
C/H	1.35	1.31	1.23
C	89.97	89.57	88.84
H	5.88	5.72	6.04
N	2.09	2.04	1.72
O	1.32	2.06	2.67
S	0.74	0.37	0.42
Viscosity, cps:			
@150°C	NA	12,160	2395
@160°C	NA	2,430	909
@180°C	NA	430	209
@200°C	NA	150	72

ALUMINUM COMPANY OF AMERICA, INC.

KEY TO MAJOR MILESTONES

- ALCOA-3-1** Review WVU reports, select candidate materials, and obtain from WVU three green coke samples of potential promise for aluminum production anodes.
- ALCOA-3-2** Set up a laboratory calcination procedure that simulates commercial rotary kiln or rotary hearth calcination.
- ALCOA-3-3** Verify that the lab calcination procedure appropriately simulates commercial calcination by microstructural examination of a commercially calcined petroleum coke and a lab calcined sample using the same green coke.
- ALCOA-3-4** Calcine the three WVU green cokes using the established procedure, examine microstructurally, and assess suitabilities for use in aluminum production anodes based on microstructures.
- ALCOA-3-5** Assess overall suitabilities of the materials, including additional factors such as real density, impurity levels, and yield on calcination.

TECHNICAL HIGHLIGHTS

A review of previous WVU work on cokes intended for graphite applications suggested that hydrogenated coal-derived feedstocks are more likely to produce cokes of optimum physical characteristics for aluminum production anodes than non-hydrogenated feedstocks. However, since hydrogenation increases cost, it would be desirable to use coal-derived cokes with no or minimal hydrogenation. Based on the WVU reports reviewed, three green cokes produced using no hydrogenation, mild hydrogenation, and severe hydrogenation were requested and received from WVU for evaluation.

Several publications on simulating commercial rotary kiln or rotary hearth calcination in bench scale calcinations were reviewed. Since the major factor in successful simulation appears to be a rapid heat-up rate (50°-100°C/min.), a procedure involving pushing of a container of green coke into a furnace preheated to 1250°C was adopted. For verification of the suitability of the procedure, a sample of rotary-hearth-calcined petroleum coke currently used in aluminum production anodes as well as a sample of its green coke precursor were obtained. The green coke was calcined using the lab procedure. Real density of the lab calcined sample was 2.08 g/cm³, which is within the range normally specified for calcined cokes for aluminum production anodes so that the maximum temperature selected is appropriate.

The commercially calcined and lab calcined petroleum coke samples must be mounted, polished, and evaluated microstructurally to determine whether they are equivalent. If no modifications to the lab calcination procedure are required (or after modification, if necessary), the WVU green coke samples will be lab calcined and evaluated.

ISSUES

None.

AMOCO POLYMERS, INC.

KEY TO MAJOR MILESTONES

- AMOCO-3-1 Review of WVU's Reports on Coal Based Pitches - December 31, 1995
- AMOCO-3-2 Analytical Testing and Evaluation of Coal Based Pitch - March 31, 1996
- AMOCO -3-3 Summary Report providing direction to WVU - June 30, 1996

TECHNICAL HIGHLIGHTS

The technical literature on coal-based pitches developed by West Virginia University (WVU) was reviewed in detail. Some recently published reports by WVU and UCAR Carbon Company, Inc. (UCAR), data generated by other coal consortium members, and publications by Fuller et al. related to characterization of coal-based pitches were also reviewed. The hydrogenated pitches appear to be in the desired softening point range. The sulfur contents are in the correct range but the nitrogen and oxygen contents are higher. The sulfur contents will depend upon the sulfur content of the coals used and low sulfur coals should be used for carbon fiber precursor. Milestone Amoco-3-1 was completed on schedule.

A meeting was attended on October 23, 1995 at WVU to exchange product requirements and establish preliminary product specifications. As stated earlier, the hydrogenated pitches had the correct preliminary characteristics. UCAR presented analytical data, and some of the variants tested produced large domain mesophase in spite of high nitrogen and oxygen contents. This was encouraging from a carbon fiber precursor point of view.

Meetings were attended on December 12 and 13, 1995 at WVU to discuss and plan a future strategy regarding Non-Fuel Use of Coal. Recent data on coal-based pitches were presented by the coal consortium members. Amoco made a presentation regarding why coal-based pitches may be good carbon fiber precursors and the process of evaluating them at bench-scale (most of that work is scheduled to be carried out after July 1, 1996 pending funds authorization).

ISSUES

Amoco Performance Products, Inc. is now Amoco Performance Products, a unit of Amoco Polymers, Inc. All correspondence should be addressed to the attention of Dr. Girish V. Deshpande at Amoco Polymers, Inc., 4500 McGinnis Ferry Road, Alpharetta, GA 30202. The area code has changed from 404 to 770 and the new number for Dr. Girish V. Deshpande is (770) 772-8330.

Amoco would like to carry out a mesophase reactivity test on coal-based pitch produced by WVU. This pitch was produced very similar to WVU pitch A076 which gave the largest domained mesophase of the materials examined to date at WVU. Since UCAR has done most of the analytical testing on pitch A076, Amoco will not carry out the analytical testing proposed in the Task 1 description.

FIBER MATERIALS, INC.

QUALITY MANAGEMENT REPORT*Key to Major Milestones*

- FMI-3-1:** *Literature Review of West Virginia University Solvent Extracted Pitches*
- FMI-3-2:** *Requirement Documents for Two Solvent Extracted Pitches*
- FMI-3-3:** *Evaluation of Two West Virginia University Pitches*

Technical Highlights

- FMI-3-1:** This milestone was completed in a previous quarter
- FMI-3-2:** This milestone was completed in the previous quarter.
- FMI-3-3:** FMI completed evaluation of one sample of pitch supplied by WVU, with the results presented in the previous quarterly report. During this reporting period, a carbon fiber preform was prepared to demonstrate WVU pitch can be used to densify a carbon-carbon composite. FMI is waiting for additional pitch with which to densify the component.

Issues

None.

ATTACHMENT 2

Letters to Secretary Hazel O'Leary
in support of the CPC program

National Research Center for Coal and Energy

West Virginia University

December 1, 1995

RE: Urgent Need for Continued Funding of the Carbon Products Consortium (CPC)

Dear Friend of the CPC:

You are invited to read the enclosed letters from the six charter members of the CPC, UCAR Carbon Company, Koppers Industries, Aluminum Company of America, AMOCO Performance Products, Fiber Materials Inc., and West Virginia University.

These letters attest to the commitment and initial success of the participants in this cooperative research and product development effort. The CPC is developing coal-based high value carbon products which could have substantial technical impacts on the industry as well as help create and preserve jobs.

A three-year CPC program with dollar for dollar cost-sharing by the industrial participants has been approved for DOE support; however, only first year funding, through early 1996, has thus far been committed to the program. A modest investment of only \$500,000 would provide level funding for an additional year and would continue the synergy, momentum, and promising results of the CPC.

Your support and assistance in developing continuation funding for the CPC will be deeply appreciated. Please contact any member of the consortium if you wish additional information.

Most sincerely yours,

Caulton L. Irwin
(304)293-7318 X403 Phone
(304)293-3749 Fax

CARL11:CPCLET

UCAR CARBON COMPANY INC.

12900 Snow Road, Parma, Ohio 44130

**Technology Department
Parma Technical Center****(216) 676-2000
Fax: (216) 676-2423**

October 27, 1995

The Honorable Hazel R. O'Leary
Secretary of Energy
1000 Independence Avenue, S. W.
Washington, DC 20585

Dear Secretary O'Leary:

The Carbon Products Consortium (CPC) is a unique, synergistic university/industry-government initiative whose work is creating high-value carbon products from coal and had the potential of a major impact on the domestic carbon products industry. The West Virginia University coal processing technologies provide non-polluting, secure alternatives to by-product coke ovens and crude oil refineries as sources of feedstock pitches and high-grade cokes.

With just eight months of DOE funding, and dollar-for-dollar cost sharing by the industrial partners, phase one feasibility studies of the coal-based materials are very promising:

UCAR Carbon is now ready to produce a small-scale, all coal-based graphite electrode using the WVU coal extract product. We have characterized some of the WVU materials, and our initial results show that they could be suitable as binder and impregnating pitches, precursors for coke, activated carbons, and carbon fibers. These processed coal extracts are unique materials and could have potential use for the broad range of carbon products encompassed by the various industrial members of the consortium.

We have just begun to identify the opportunities offered by this novel technology since the one-year-funded program is due to expire within a few months. Continued government support is crucial to maintain the momentum of the Carbon Products Consortium and to develop the promising results obtained thus far.

Very truly yours,

A handwritten signature in dark ink, reading "C. F. Chang", with a long, sweeping horizontal stroke extending to the right.

C. F. Chang
Director of Research and Raw Materials

**KOPPERS
INDUSTRIES**

Koppers Industries, Inc.
1005 William Pitt Way
Pittsburgh, PA 15238

Lawrence F. Flaherty
Vice President,
Total Quality and Technology

Telephone: (412) 826-3966
FAX: (412) 826-3999

October 27, 1995

The Honorable Hazel R. O'Leary
Secretary of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Secretary O'Leary,

The Carbon Products Consortium (CPC) is a cooperative initiative of government, academic and industrial entities working to create high-value carbon products from coal. This research could have a major positive impact on the U. S. Carbon products industry and there exists the exciting possibility of spin-off technologies such as carbon foams and reinforced wood composites.

Koppers Industries is one of the five industrial partners in the CPC and we have made a significant commitment to the success of this effort. We urgently appeal that you make every effort to secure second year funding for the CPC. This second year funding requirement is \$500,000, a relatively small amount of investment to maintain the synergy of the CPC work. An additional funding of \$200,000 would initiate the development of the spin-off carbon foams and fiber reinforced wood composite technologies mentioned above.

Thank you for your consideration and support.

Sincerely,

Lawrence F. Flaherty
Vice President
Total Quality & Technology

LFF/pks

Aluminum Company of America
Alcoa Technical Center

1995 November 21
95-DRW-120

Mr. Marvin I. Singer
Deputy Assistant Secretary
U. S. Department of Energy
Fossil Energy
Advanced Research & Special Technologies
Room 4G052
1000 Independence Avenue
Washington, DC 20585

SUBJECT: CARBON PRODUCTS CONSORTIUM

Dear Mr. Singer:

The Aluminium Company of America is a participant in the Carbon Products Consortium (CPC), in partnership with DOE-Oak Ridge, West Virginia University and four other industrial partners, UCAR, Fiber Materials Inc., Koppers, and Amoco. The CPC is a synergistic Government-University-Industry collaborative initiative whose purpose is to create high-value carbon products from coal. The technologies being examined under the CPC program have the potential to make a major impact on the domestic carbon products industry.

Alcoa's specific interest is in the coal extraction process and its potential to provide a cost-competitive, improved feedstock for fabrication of carbon electrodes. Carbon electrodes are a critical part of the electrolytic process for aluminum production. Over 0.4 lb of anode carbon is consumed for each 1 lb of aluminum produced. Quality of this anode carbon is an important factor in both the amount of carbon consumed and the energy usage in producing aluminum.

The coal extraction process under development by the CPC offers promise for a cost competitive process for both a petroleum coke substitute and improved binder pitch source. The major raw material used in producing carbon anodes, petroleum coke, is a by-product of the petroleum refineries and, due to a number of factors, the supply of anode-grade coke

is deteriorating. Moreover, much of the crude oil feedstock that results in anode-grade petroleum coke is imported. Additionally, coal tar pitch, the binder used in anode production, is also produced from a by-product, coal tar generated during metallurgical coke production for steelmaking. Due to changes in metallurgical coke requirements, the continued quantity and quality of suitable tars are in doubt.

The funding of the CPC efforts are shared by DOE and the private sector on a fifty-fifty basis. Although a multi-year plan to develop this process for carbon anode raw material as well as products of value for other industrial partners is in place, DOE funding beyond early 1996 has not been committed. Because of the potential value of this program to the domestic aluminum industry, we urge DOE to make every effort to secure second year funding for the CPC.

Sincerely,

David R. Williams
Contracting Officer
Alcoa Technical Center

cc: Mr. David J. Beecy
Office of Advanced Research
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Advanced Research & Special Technologies
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**Amoco Chemicals
Polymers Business Group**

4500 McGinnis Ferry Road
Alpharetta, Georgia 30202-3914
404-772-8200

November 16, 1995

The Honorable Hazel R. O'Leary
Secretary of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Secretary O'Leary:

The first year collaboration of government, academic and industrial participants in the Carbon Products Consortium (CPC) has identified several high-value carbon products derived from coal. Coal-based carbon fibers appear to be highly viable relative to today's petroleum-based carbon fibers. Applications for the coal-based fibers are exciting and range from high thermal conductivity composites for passive thermal management in electronics to engineered lumber to meet emerging challenges of the building/materials industry.

Amoco, as one of the five industrial participants in the CPC, is committed to a successful collaborative effort. Second year CPC funding (\$500,000) is critical to success. We implore you to make every effort to secure the required second year CPC funding.

Your consideration and support is highly appreciated.

Sincerely,

Dr. Michael J. Michno, Jr.

Let951116-HRO

FIBER MATERIALS, INC.

... for materials ingenuity

5 Morin Street
Biddeford Industrial Park
Biddeford, Maine 04005-4497
Tel: 207-282-5911
Fax: 207-282-7529

FMI-DRL-95-70
November 20, 1995

The Honorable Hazel R. O'Leary
Secretary of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Secretary O'Leary:

The Carbon Products Consortium (CPC) consists of carbon experts from academia, industry and government laboratories. The CPC utilizes solvent extraction processes to efficiently convert low cost, abundant coal into pitches which can be utilized in the manufacture of aerospace materials such as carbon fibers and carbon-carbon composites, electrode materials for aluminum smelting, and activated carbons for purification and environmental clean-up. The CPC has just begun to investigate technologies for low-cost energy absorbing foams for automotive door panels and low cost carbon-carbon material fabricated from carbon foam.

FMI and the Department of Defense are particularly interested in a domestic source of pitch which will relieve dependence on foreign oil for petroleum based pitches, and on environmentally unsound coking processes for coal tar pitch. The solvent extraction processes being developed and optimized by the CPC provide the desired coal-based pitches. It is essential that this work be continued.

As an indication of its commitment to the CPC program, FMI, a small business, has invested a significant portion of its funds in the program. Since only one year of a three year program has been funded, continued government funding is essential at this time for the CPC to continue its important research. We believe second year funding of \$500,000 is a prudent investment of government funds and will enable the CPC's exciting research and product development effort to continue at a minimal level.

Sincerely,

FIBER MATERIALS, INC.

A handwritten signature in dark ink, appearing to read 'David R. Loper', is written over the company name.

David R. Loper
Manager of Operations

Research Office

West Virginia University

Office of the Associate Provost for Research and Economic Development

November 10, 1995

The Honorable Hazel R. O'Leary
Secretary of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Secretary O'Leary:

I am writing to urge your personal support for the continued Department of Energy funding of a unique U.S. industry-university-government endeavor that promises to bring high value-added commercial products to the world market and reestablish domestic sources of supply for lightweight carbon materials.

The endeavor to which I refer, the Carbon Products Consortium, has proven the feasibility of creating a wide variety of carbon products -- from carbon fibers to graphite electrodes, and from various pitches and cokes to carbon foams that are unique in the world. And the new processes that underlie them all rely on non-polluting solvent extraction of such products from domestic coal, all but obviating the need for such products from coke ovens and crude oil refineries. West Virginia University, in partnership with Oak Ridge National Laboratory, developed these processes. Our industrial partners -- ALCOA Aluminum, Koppers Industries, UCAR Carbon Company, Amoco Performance Products, and Fiber Material Inc. -- stand on the threshold of commercializing them at significant impact on the world carbon market. DOE funding, thus far matched dollar-for-dollar by the industrial partners, extends only through February, 1996; and laboratory demonstrations have yet to be duplicated in commercial practice. In spite of the impressive industrial commitment to continue this program, in the United States it is only the Federal Government that provides the long-term, patient money to bridge the gap between university invention and commercial viability. A second year of funding at a level of \$500,000 would maintain the momentum.

We believe that the potential economic benefit to the nation in terms of new domestic jobs, value-added manufacturing for a multi-billion dollar world market, and significantly increased tax base argue strongly for continuing the investment that DOE has begun. We earnestly solicit your personal support for this effort.

Sincerely,

William C. Miller