

Appendices

APPENDIX **A**

Invention Disclosures, Trade Secrets and Patents Pending

Method of Obtaining a Significant Initial Strength in Fuel Briquettes with Reduced Levels of Binder — **Taulbee**

Use of a Caustic Oxide to Facilitate the Measurements of Chemical Change Blends or Briquettes — **Taulbee**

Controlled Modification of the Structure of Activated Carbon — **Jagtoyen and Derbyshire**

Activated Carbon Fiber Composite Material and Method of Making — **Burchell, Weaver, Chilcoat, Derbyshire, and Jagtoyen**

Preparation of Monolithic Composite Material — **Kimber**

Activated Carbon Fiber Composites for Removal of Organics, Lead and Microbial Pathogens from Drinking Water — **Derbyshire and Jagtoyen**

Improvement Patent on Composites for Organics and Virus Removal from Drinking Water — **Jagtoyen and Brion**

Electrostatic Fine Particle Separator — **Neathery, Stencel, Schaefer and Ban**

Apparatus and Method for Triboelectrostatic Separation — **Stencel, Ban, Neathery and Schaefer**

Multistage Turbulent Electrostatic Separation System — **Schaefer, Stencel, Neathery, Ban and Finseth**

Cylindrical Multistage Electrostatic Cell System — **Schaefer, Stencel, Neathery, Ban and Finseth**

Triboelectric Separator with Mixing Chamber and Pre-Separator — **Stencel, Schaefer, Ban, Neathery and Li**

Technology for the Production of High Quality Fillers from Fly Ash — **Robl and Groppo**

Mixing and Dispersion of Nanotubes by Gas or Vapor Expansion — **Derbyshire, Andrews and Safadi**

Formation of Conducting Layers Within Polymer Films Using Carbon Nanotubes — **Andrews, Rantell, Safadi and Vilain**

Patents Granted

US Patent No. 5,702,612, "Method and Apparatus for Flotation Separation," **X.H. Wang**, Date of Patent December 30, 1997.

US Patent No. 5,721,186, "Method for Producing Catalysts from Coal," **M. Farcasiu, F. Derbyshire, P. Kaufman, and M. Jagtoyen**, Date of Patent February 24, 1998.

US Patent No. 5,817,230, "Method for Improving the Pozzolan Character of Fly Ash," **J.G. Groppo, T.L. Robl and C.J. McCormick**, Date of Patent October 6, 1998.

APPENDIX **B**

Refereed Publications (FY 97-98)

Ban, H., Li, T.X., Hower, J.C., Schaefer, J.L., and Stencel, J.M., "Dry triboelectrostatic beneficiation of fly ash," **Fuel**, v. 76, pp. 801-805 (1997).

Bi, M., Pan, W.P., Lloyd, W.G. and Davis, B.H. "Platinum sulfated zirconia catalysts. Fate of chlorine during activation," **Catalysis Letters**, v. 50, pp. 187-191 (1998).

Blanchard, L.J., Robertson, J.D., Srikantapura, S. and Parekh, B.K. "PIXE Analysis of the Hydrothermal Leaching of Trace Elements in Coal," **Journal of Radio-analytical and Nuclear Chemistry**, v. 22(1-2) pp. 23-28 (1997).

Chokkaram, S., Srinivasan, R., Milburn, D.R. and Davis, B.H. "Conversion of 2-octanol over nickel-alumina, cobalt-alumina and alumina catalysts," **Journal of Molecular Catalysis**, A-Chemical, v. 121 (2), pp. 157-169 (1997).

Dempsey, T.C., LaFay, V.S., Neltner, S.L., Taulbee, D.N. "Understanding the Properties of Carbonaceous Additives and their Potential to Emit Benzene, AFS Trans. 97-109," published by the **Am. Foundrymen's Soc.**, Des Plaines, IL, pp. 109-117 (1998).

De Wet, C.B., Moshier, S.O., Hower, J.C., De Wet, A.P., Brennan, S., Helfrich, C.T., and Raymond, A.L. "Disrupted coal and carbonate facies within two Pennsylvanian cyclothems, Southern Illinois Basin, USA," **Geological Society of America Bulletin**, v. 109, pp. 1231-1248 (1997).

Hower, J.C., Ban, H., Schaefer, J.L., and Stencel, J.M. "Maceral/microlithotype partitioning through triboelectrostatic dry coal cleaning," **International Journal of Coal Geology**, v. 34, pp. 277-285 (1997).

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- Huggins, F.E., Srikantapura, S., Parekh, B.K., Blanchard, L. and Robertson, D. "XANES Spectroscopic Characterization of Selected Elements in Deep-Cleaned Fraction of Kentucky No. 9 Coal," **Energy Fuels**, v. 11(3), pp. 691-701 (1997).
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- Grigorian, L., Sumanasekara, G., Loper, A., Fang, S., Alien, J., Eklund, P.C. "Transport Properties of Alkali Metal Doped Single Wall Carbon Nanotube," **Physics Review B**, v. 58, pp. 4195 (1998).
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Venkateswaran, U.D., Rao, A.M., Richter, E., Menon, M., Rinzler, A., Smalley, R.E., Eklund, P.C. "Surface physics, low-dimensional systems, and related topics - Probing the single wall carbon nanotube bundle: Raman scattering under high pressure," **Physics Review B**, v. 59(16) pp. 10928 (1999).

APPENDIX

Organizations Represented by Visitors to the CAER FY97-98

Addington Resources, Ashland, KY
Advanced Pozzolan Technologies, Inc., Atlanta, GA
American Electric Power, Columbus, OH
Argonne, Chicago, IL
Ash Resources (PTY) Ltd., Johannesburg, South Africa
Central Metallurgical R&D Institute, Cairo, Egypt
Chevron, Richmond, CA
Conoco, Houston, TX
CONSOL, Library, PA
Corning Glass, Corning, NY and Harrodsburg, KY
Cosmo Research Inst., Japan
Dept. of Applied Geology, University of New South Wales, Sydney, Australia
DIGITA, University of Cagliari, Italy
East Kentucky Power, Cooperative, Inc., Winchester, KY
Environmental Tech. Group, Inc., Baltimore, MD
EPRI, Palo Alto, CA
FETC, Pittsburgh, PA
Geological Survey of Israel, Jerusalem, Israel
Global Energy
Highland Industries, Inc., Greensboro, NC
The Hill & Griffith, Co., Cincinnati, OH
ISGS (Indiana State Geological Survey), Bloomington, IN
Koch Industries, Cincinnati, OH
KY Dept. for Surface Mining, Frankfort, KY
Laboratoire d'Hygiene de Recherche, Vandoeuvre les Nancy, France
Lafarge, Southfield, OH
LDP Assoc., Hamilton Square, NJ
Maryland Dept. of Natural Resources, Power Plant Assessment, Annapolis, MD
Metropolitan Energy Systems, Inc., Cincinnati, OH
Middough Assoc., Cleveland, OH
OISTL, University of Kentucky, Lexington, KY
Potomac Electric Power Co., Upper Marlboro, MD
Potomac Electric Power Co., Washington, DC
River Trading, Cincinnati, OH
Robbins, Inc., Beckley, WV
Sastech, Sasolburg, South Africa
Silvertip, Inc., Denver, CO
Southern Illinois University, Carbondale, IL
Southern Research, Birmingham, AL
Stanley Electric, London, OH
Startec, Inc., Columbus, OH
Taebaek, Seoul, Korea
TECO Coal, Nevisdale, KY
Trans-Ash, Marietta, GA
United Catalyst, Inc., Irvine, CA
United Catalyst, Inc. Louisville, KY

University of Burgundy and Ecole Nationale Superieure d'artset Metiers, Cluny, France
University of Calcutta, Calcutta, India
University of Cincinnati, Cincinnati, OH
University of Technology and the University of Goteborg, Goteborg, Sweden
U.S. Equipment, Distributors, Huntington, WV
Wyatt Energy, Woodstock, VT
Zemex Corp., Atlanta, GA

Organizations Represented by Visitors to the CAER FY98-99

ACarb & Messier- Bugatti, Covington, KY
Allegheny Power, Fairmont, WV
Allison Engines, Inc., Indianapolis, IN
Applied Sciences Inc., Dayton, OH
Baylor University, Waco, TX
BHP, New Castle, NSW, Australia
Bluegrass Energy, Lexington, KY
Boral Material Technologies, San Antonio, TX
Canyon Resources Inc., Avon Lake, OH
Carpenter, Indianapolis, IN
Conoco, Inc., Houston, TX
Conoco, Inc., Ponco City, OK
CONSOL Inc., Library, PA
Consortium for Premium Carbon Products from Coal, University Park, PA
Duracell, Needham, MA
East Kentucky Power Cooperative, Inc., Winchester, KY
Electric Power Research Institute, Palo Alto, CA
Energy International, Pittsburgh, PA
Georgia Stone, Inc., Letrell, TN
Global Energy, Cincinnati, OH
Gulf Power, Pensacola, FL
Heritage Research Group, Indianapolis, IN
Hill & Griffith Co., Cincinnati, OH
HTI, Lawrenceville, NJ
Idemitsu Kosan Co., Ltd., Chiba, Japan
Independent Consultant, Almaty, Kazakhstan
Indiana Geological Survey, Bloomington, IN
Indiana University, Bloomington, IN
ISG Resources, Inc., Knoxville, TN
Kentucky Processing, Irvin, KY
Kobe Steel, Ltd., Osaka, Japan
Korea Fly Ash Cemento., Ltd., Boryung-Si Chung-Nam, Korea
KY DOE/EPSCoR Subcommittee, Lexington, KY
Land Reclamation Systems, Inc., Pittsburgh, PA
LDP, Hamilton Square, NJ
Lewis Minerals Corp., Ashville, NC
MAS-Hamilton, Lexington, KY
MER Corp., Tucson, AZ
M.I.T., Cambridge, MA
Monash University, Melbourne, Australia
New Horizons, Independence, MO
New Horizons Energy, Cincinnati, OH
NexGen Resources, Aurora, CO
Oak Ridge National Laboratory, Oak Ridge, TN
Oakland University, Rochester, MI
Pall Cortland Manufacturing, Syracuse, NY
Pennsylvania State University, University Park, PA
R W Beck, Inc., Denver, CO
RDE, Crystal Lake, IL
Robbins Corp. Beckley, WV
Robert Bencer Consulting, Pittsburgh, PA
Rogers Group, Inc., Bloomington, IN

Sempra Energy, Washington, PA
 SEP, Saint Medard en Jalles Cedex, France
 Southern Co. Services, Atlanta, GA
 Southern Co. Services, Birmingham, AL
 Southern Illinois University at Carbondale,
 Carbondale, IL
 Specialized Services, Brentwood, TN
 State University at New York, Stony Brook, NY
 Sun Refining & Marketing Co., Marcus Hook, PA
 TECO coal, Nevisdale, KY
 TekPak, Chicago, IL
 Texaco Global Gas and Power, Houston, TX

TMM, Erlanger, KY
 TTI, Inc., Omaha, NE
 University of Alabama, Tuscaloosa, AL
 University of Cincinnati, Cincinnati, OH
 University of Melbourne, Melbourne, Australia
 University of Nancy, France, Nancy, France
 U.S. Department of Energy, Federal Energy Technology
 Center, Pittsburgh, PA
 US Equipment, Huntington, WV
 Valvoline, Lexington, KY
 Wallace Industries, Ithica, NY
 West Virginia University, Morgantown, WV

APPENDIX **D**

Projects Underway During FY97/98 and 98/99

| Government Sponsorship | |
|---|---|
| SPONSOR | PROJECT |
| U.S. Department of Energy (DoE) | <ul style="list-style-type: none"> ▶ Advanced Coal Liquefaction Concepts for PETC Generic Bench-Scale Unit ▶ An Integrated Carbon Recovery System from Fine Coal Wastes ▶ Exploratory Research on Novel Concepts in Direct Coal Liquefaction ▶ High Volume-High Value Usage of Dry Gas Desulfurization (FGD) By-Products in Underground Mines (Haulback) ▶ Proof-of-Concept Scale Testing of Improved Coal Preparation Technologies ▶ Pulverization Induced Charge: In-line Dry Coal Cleaning ▶ Technology Development for Iron Fischer-Tropsch Catalysts ▶ Consortium for Fossil Fuel Liquefaction Science ▶ Novel Approach to the Separation and Recovery of Gypsum and Pyrite ▶ Recovery of Fuel and Adsorbent Carbons from Utility Ash Ponds and Landfills ▶ DOE/KY Experimental Program to Stimulate Competitive Research (EPSCoR): <ul style="list-style-type: none"> - Management and Implementation Grant - EPSCoR Program Evaluation Instrument - CAER Summer High School Internship - Characterization of Hazardous Trace Elements from Coals, Cleaning Wastes, and Combustion Products - Synthesis and Application of Sol Gel Yittria Stabilized Zirconia |
| Illinois Clean Coal Institute | <ul style="list-style-type: none"> ▶ An Innovative Approach to In-Situ Dewatering and Hardening of Fine Clean Coal Slurries |
| National Aeronautics and Space Administration (NASA) | <ul style="list-style-type: none"> ▶ NASA/KY EPSCoR: Materials Processing for Space Mission Energy Needs ▶ Pneumatic Soil Sampler Field Test |
| National Science Foundation (NSF) | <ul style="list-style-type: none"> ▶ Materials Research Science and Engineering Center (MRSEC) |
| Oak Ridge National Laboratory (ORNL) | <ul style="list-style-type: none"> ▶ Carbon Fiber Composite Molecular Sieve Materials |
| Industrial Sponsorship | |
| SPONSOR | PROJECT |
| Advanced Pozzolon Technologies | <ul style="list-style-type: none"> ▶ Beneficiation of Fly Ash for Concrete Applications and High Value Product Recovery/Phase II: Pilot Studies |
| United Catalyst, Inc. Westvaco Corporation | <ul style="list-style-type: none"> ▶ Selective Hydrogenation of Catalysts ▶ Fundamental Studies of Wood Activation |
| Electric Power Research Institute | <ul style="list-style-type: none"> ▶ Performance Characterization and Economic Analysis of Dry Triboelectrostatic Separation of Carbon for Fly Ash Beneficiation ▶ Dewatering of Fine Clean Coal Slurry Using Waste Material |
| Tennessee Valley Authority Various Petrochemical Companies (not named for reasons of confidentiality) | <ul style="list-style-type: none"> ▶ Circulating Dry Scrubber for Flue Gas Clean Up ▶ Testing of Proprietary Catalysts Testing of Proprietary Catalysts Testing of Proprietary Catalysts |

APPENDIX **E**

Financial Summary - Fiscal Years 97-98 and 98-99

| | FISCAL YEAR '98 | | | FISCAL YEAR '99 | | |
|------------------------------|-----------------|-------------------|--------------|-----------------|-------------------|--------------|
| Funding by Source | State | Extramural | Total | State E | Extramural | Total |
| Total | \$ 4,192,821 | \$ 2,395,688 | \$ 6,588,509 | \$ 4,191,104 | \$ 2,604,038 | \$ 6,795,142 |
| | FISCAL YEAR '98 | | | FISCAL YEAR '99 | | |
| By Expense Category | State | Extramural | Total | State | Extramural | Total |
| Research & Development | \$ 2,120,623 | \$ 1,804,450 | \$ 3,925,073 | \$ 1,980,217 | \$ 2,008,810 | \$ 3,989,027 |
| Curriculum & Instruction | \$ 169,249 | \$ 30,734 | \$ 199,983 | \$ 153,625 | \$ 31,523 | \$ 185,148 |
| Research Support | \$ 680,936 | \$ 560,504 | \$ 1,241,440 | \$ 852,750 | \$ 563,705 | \$ 1,416,455 |
| Facility O&M | \$ 643,504 | \$ | \$ 643,504 | \$ 643,146 | \$ | \$ 643,146 |
| General & Administrative | \$ 578,509 | \$ | \$ 578,509 | \$ 561,366 | \$ | \$ 561,366 |
| Total | \$ 4,192,821 | \$ 2,395,688 | \$ 6,588,509 | \$ 4,191,104 | \$ 2,604,038 | \$ 6,795,142 |
| | FISCAL YEAR '98 | | | FISCAL YEAR '99 | | |
| By R&D Topic | State | Extramural | Total | State | Extramural | Total |
| Power Generation & Emissions | \$ 317,381 | \$ 195,611 | \$ 512,992 | \$ 244,924 | \$ 182,300 | \$ 427,224 |
| Catalysis: Fuels & Chemicals | \$ 464,092 | \$ 633,003 | \$ 1,097,095 | \$ 476,949 | \$ 1,066,046 | \$ 1,542,995 |
| Applied Petrography | \$ 135,396 | \$ | \$ 135,396 | \$ 136,955 | \$ | \$ 136,955 |
| Coal Cleaning | \$ 195,002 | \$ 210,805 | \$ 405,807 | \$ 226,660 | \$ 81,545 | \$ 308,205 |
| Analytical Services | \$ 387,857 | \$ | \$ 387,857 | \$ 367,686 | \$ | \$ 367,686 |
| Carbon Materials | \$ 382,168 | \$ 556,880 | \$ 939,048 | \$ 232,146 | \$ 452,903 | \$ 685,049 |
| Waste Management | \$ 238,727 | \$ 208,151 | \$ 446,878 | \$ 294,897 | \$ 226,016 | \$ 520,913 |
| Total Research | \$ 2,120,623 | \$ 1,804,450 | \$ 3,925,073 | \$ 1,980,217 | \$ 2,008,810 | \$ 3,989,027 |