FEDERAL AGENCIES ACTIVE IN CHEMICAL INDUSTRY-RELATED RESEARCH AND DEVELOPMENT

September 29, 1995

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Office of Industrial Technologies
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Prepared by:

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Washington, DC

MASTER

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EXECUTIVE SUMMARY

The Energy Policy Act of 1992 calls for a program to further the commercialization of renewable energy and energy efficient technologies for the industrial sector. In response to this, the Department of Energy (DOE) has realigned its Office of Industrial Technologies (OIT) around seven energy-intensive industries, one of the seven being the chemical industry.

The primary objective of the OIT Chemical Industry "Team" is to work in partnership with the U.S. chemical industry to maximize economic, energy, and environmental benefits through research and development of innovative technologies.

One of the goals of the chemical industry team is to develop the appropriate interfaces within DOE and external federal, state, and private sector stakeholders, along with communication of efforts and successes to customers and stakeholders. This document was developed to inventory organizations within the federal government on current chemical industry-related research and development.

While an amount of funding or number of projects specifically relating to chemical industry research and development was not defined in all organizations, identified were about 60 distinct organizations representing 7 cabinet-level departments and 4 independent agencies, with research efforts exceeding \$3.5 billion in fiscal year (FY) 1995. Efforts were found to range from less than \$500 thousand per year at the Departments of Agriculture and the Interior to over \$100 million per year at the Departments of Commerce, Defense, Energy, and Health and Human Services and the National Aeronautics and Space Administration. The total number of projects in these programs exceeded 10,000.

This document is complete to the extent that agencies volunteered information. Additions, corrections, and changes are encouraged and will be incorporated in future revisions.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	iii
TABLE OF CONTENTS	v
INTRODUCTION	1
FEDERAL AGENCIES	
Department of Agriculture	3
Agricultural Research Service	4
Cooperative State Research Service	5
Food Safety and Inspection Service	6
Forest Service	8
Department of Commerce	9
Bureau of the Census	10
National Institute of Standards and Technology	
Advanced Technology Program	11
Chemical Science and Technology Laboratory	13
Materials Science and Engineering Laboratory	15
Department of Defense	17
Advanced Research Projects Agency	
Defense Science Office	18
Technology Reinvestment Project	19
Department of the Air Force	
Office of Scientific Research	21
Small Business Innovation Research Program	22
Department of the Army	
Army Research Laboratory	23
Army Research Office	24
Department of the Navy	
Office of Naval Research	25
Small Business Innovation Research Program	26
Strategic Environmental Research and Development Program	28
Department of Energy	31
Office of Energy Efficiency and Renewable Energy	
Office of Industrial Technologies	32
Office of Building Technologies	34
Office of Transportation Technologies	35
Office of Utility Technologies	37
Office of Defense Programs	39
Office of Energy Research	

Basic Energy Sciences	
Advanced Energy Projects Division	40
Chemical Sciences Division	42
Energy Biosciences Division	44
Small Business Innovation Research (SBIR) Office	46
Office of Health and Environmental Research	48
Office of Environmental Restoration and Waste Management	50
Office of Fossil Energy	51
DOE Laboratories and Facilities	52
Department of Health and Human Services	53
Public Health Service	
Agency for Toxic Substances and Disease Registry	54
Centers for Disease Control	
National Center for Environmental Health	55
National Institute for Occupational Safety and Health	56
Food and Drug Administration	
Center for Drug Evaluation and Research	57
National Center for Toxicological Research	58
National Institutes of Health	
National Institute of Environmental Health Sciences	
National Toxicology Program	59
Superfund Basic Research Program	60
National Institute of General Medical Sciences	61
SBIR/STTR Solicitation Office	63
Department of the Interior	65
Bureau of Mines	
Center for Materials Research Partnerships	66
Center for Pollution Prevention and Control	67
Division of Environmental Technology	68
Department of Transportation	69
Federal Highway Administration	70
Environmental Protection Agency	71
Environmental Technology Initiative	72
Office of Prevention, Pesticides and Toxic Substances	
Design for the Environment Program	74
Office of Pollution Prevention	75
Office of Research and Development	
National Center for Extramural Research and Quality Assurance	76
National Risk Management Research Laboratory	
Air Pollution Prevention and Control Division	78
Pollution Prevention Research Branch	79

National Aeronautics and Space Administration	83
Microgravity Sciences and Applications Division	84
Office of Space Access and Technology	85
National Science Foundation	87
Bioengineering and Environmental Systems Division	88
Chemical and Transport Systems Division	90
Chemistry Division	91
Design, Manufacture, and Industrial Innovation Division	92
Materials Research Division	93
Molecular and Cellular Biosciences Division	94
Tennessee Valley Authority	97
Environmental Research Center	98
AVAILABLE INTERNET HOME PAGES FOR ADDITIONAL INFORMATION	99
ACRONYMS	101
REFERENCES	103
UPDATE FORM	105
INDEX	107

INTRODUCTION

The U.S. chemical industry is an exceptionally large, complex, and diverse segment of the manufacturing sector. In 1992, this industry shipped products worth \$306 billion while employing 850,000 workers. The industry produces more than 60,000 products ranging from basic organic and inorganic commodity chemicals such as ethylene and sulfuric acid to mass-market consumer goods such as drugs, detergents and paints.

A key to the success of the chemical industry has been its traditionally large R&D funding and its strong propensity to innovate. In 1992, more than \$16 billion was spent on R&D, or roughly 5.5% of chemical industry shipments. This compares to a manufacturing sector average of 3%.

In addition, the chemical industry is a large energy user. In 1991, the industry used over 5 quadrillion Btu of energy, or about 25% of manufacturing energy use. The chemical industry also generates large amounts of waste, including about 20% of non-hazardous manufacturing wastes, about 90% of hazardous manufacturing wastes, and about 40% of toxic manufacturing wastes.

Chemical Industry Profile
(data for latest year available)

Value of Shipments	\$306 billion
Total Employment	850,000 jobs
Capital Expenditures	\$16.5 billion
Net Trade Balance	\$15.5 billion
Energy Consumption	5.05 quadrillion Btu
Waste Generation	1.84 billion tons
Average Hourly Earnings	\$15.25

The Department of Energy (DOE) recognizes the opportunity to save energy, reduce pollution, and improve the competitiveness of the U.S. chemical industry through the development of innovative technologies. As part of DOE's Office of Energy Efficiency and Renewable Energy, the Office of Industrial Technologies (OIT), through partnerships with industry, government, and non-governmental organizations, develops and delivers advanced energy efficiency, renewable energy, and pollution prevention technologies for industrial applications.

For the chemical industry in particular, technologies that increase chemical conversion efficiency, reduce fossil fuel dependence, reduce waste product generation, increase conversion and recycling of waste products, and better utilize waste heat are being developed by OIT.

The development of these technologies have been authorized by several legislative actions, most recently by the passage of the Energy Policy Act of 1992 (Public Law 102-486), and in particular, Sections 2101 (General Improved Energy Efficiency), Section 2107 (Improving Efficiency in Energy-Intensive Industries), and Section 2108 (Energy Efficient Environmental Program).

OIT has recently been realigned into teams to focus primarily on seven energy-intensive industries, one of the seven being the chemical industry. The management and understanding of the OIT Chemical Industry Team efforts can be assisted by the development of a comprehensive inventory of federal agency involvement in these areas. The intent of the inventory is to reduce redundant efforts and identify areas of mutual interest, in order to increase the effectiveness of the management of these programs.

This report includes R&D efforts that relate to the following:

- Chemical industry R&D (both product and process)
- Chemicals user's R&D (i.e., toxic materials substitution)
- Chemicals equipment supplier R&D (i.e., automated machinery)
- Chemicals feedstock supplier R&D (i.e., alternative feedstocks)
- Chemical transportation R&D (i.e., from manufacturing site to end-user).

Report Format

As part of the OIT Chemical Industry Team communications efforts, this report includes summaries of federal agency involvement in chemical industry-related R&D. In particular, each summary provides available information including:

- The agency, agency branch, mailing address, point-of-contact, position, telephone number, fax number, and e-mail address.
- A synopsis of the agency and its efforts in chemical industry-related R&D.
- The amount of funding allocated for these efforts, if a specific amount can be determined; or an overall amount of funding for the program or organization.
- The length of involvement or commitment to chemical industry-related R&D efforts.
- Any relationships to the Office of Industrial Technologies (if applicable).
- A date of last revision for the summary.

Inventory Participants

Federal agencies included in this report include the following:

- Department of Agriculture
- Department of Commerce
- Department of Defense
- Department of Energy
- Department of Health and Human Services
- Department of the Interior
- Department of Transportation
- Environmental Protection Agency
- National Aeronautics and Space Administration
- National Science Foundation
- Tennessee Valley Authority

DEPARTMENT OF AGRICULTURE

The Department of Agriculture benefits all Americans daily. It works to improve and maintain farm income and to develop and expand markets abroad for agricultural products. The Department helps to curb and to cure poverty, hunger, and malnutrition. It works to enhance the environment and to maintain our production capacity by helping landowners protect the soil, water, forests, and other natural resources. Rural development, credit, and conservation programs are key resources for carrying out national growth policies. Department research findings directly or indirectly benefit all Americans. The Department, through inspection and grading services, safeguards and ensures standards of quality in the daily food supply.

Federal Agencies Active in Chemical Industry-Related R&D

U.S. Department of Agriculture
Agricultural Research Service
Building 005
Beltsville, MD 20705

Contact: Dr. Wilda Martinez
Phone: 301-504-6275
Fax: 301-504-6699
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The Agricultural Research Service administers fundamental and applied research to solve problems in animal and plant protection and production; the conservation and improvement of soil, water, and air; the processing, storage, and distribution of farm products; and human nutrition. The research applies to a wide range of goals, commodities, natural resources, fields of science, and geographic, climatic, and environmental conditions. Research activities are carried out at over 100 domestic locations. Much of this research is conducted in cooperation with state partners in the universities and experimental stations, other federal agencies, and private organizations.

Amount of funding available for chemical industry-related R&D:

Total funding available for chemistry research efforts was approximately \$59 million in both FY 94 and FY 95.

Length of involvement in chemical industry-related R&D efforts: Unknown.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: U.S. Government Manual of Federal Agencies.
Personal communication.

Date of last revision: September 29, 1995.

U.S. Department of Agriculture
Cooperative State Research, Education and Extension Service
Office of Agricultural Materials
342 Aerospace Center
Washington, DC 20250

Contact: Dr. Daniel E. Kugler
Phone: 202-401-6861
Fax: 202-401-5179
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The Cooperative State Research, Education and Extension Service facilitates the advancement of science and technology in the nationwide agricultural research system by providing federal resources, participating in cooperative program planning and evaluation, and developing a forum for coordination between the State Agricultural Experiment Stations, the Department of Agriculture, federal research scientists, and industry partners. The primary function of the Service is the administration of federal appropriations for agricultural research and development carried on by the State Agricultural Experiment Stations and by approved schools. Service programs include research on specific problems in agriculture. The Service conducts research and development to promote new industrial uses and markets for U.S. crops. Crops under research for new uses or markets include: castor, lesquerella, corn, crambe, rapeseed, dairy products, forest byproducts, guayule, jojoba, livestock byproducts, milkweed, soybeans, taxol, and wheat. Some current or potential uses of these crops include: ethanol, plastics, nylon, soaps and detergents, paints, pharmaceuticals, natural rubber, biodegradable polymers, and adhesives.

Amount of funding available for chemical industry-related R&D:

Funding for Cooperative State Research, Education and Extension Service non-food research and development in FY 94 was approximately \$16.0 million, and funding in FY 95 was approximately \$15.6 million.

Length of involvement in chemical industry-related R&D efforts:

The Cooperative State Research, Education and Extension Service has been involved in related efforts since the Native Latex Act was passed by Congress in 1978.

Relationship to OIT programs (if applicable):

The Service has partnered with OIT in Biobased Expos in 1992 and 1994; and the Service also interfaces on agricultural matters with OIT programs (i.e., Alternative Feedstocks program).

Notes:

Sources of information: Personal communication.
New Industrial Uses, New Markets for U.S. Crops, U.S. Department of Agriculture.
U.S. Government Manual of Federal Agencies.

Date of last revision: September 15, 1995.

U.S. Department of Agriculture
Food Safety and Inspection Service
14th and Independence Ave. SW
Room 2128 South Building
Washington, DC 20250

Contact: Mr. Victor Randecker
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Description of agency involvement in chemical industry-related R&D:

The Food Safety and Inspection Service (FSIS) is an agency of the U.S. Department of Agriculture that administers a comprehensive system of inspection laws under the Federal Meat Inspection Act, the Poultry Products Inspection Act, and the Egg Products Inspection Act. The laws protect consumers by ensuring that meat, poultry, and egg products are wholesome, unadulterated, and properly marked, labeled, and packaged. The laws also protect packers by ensuring that no one gains an unfair economic advantage by marketing unwholesome or misbranded products.

Only federally inspected meat and poultry plants may sell their products in interstate or foreign commerce. In 1994, FSIS inspected over 129 million head of livestock and over 7 billion birds. More than 8,100 FSIS employees, including more than 1,100 veterinarians, carry out the inspection laws in some 6,700 meat, poultry, egg, and other slaughtering or processing plants. The meat, poultry, and egg product inspection program is responsible for inspecting, before and after slaughter, those birds, animals, and egg products intended for use as food for humans and maintaining surveillance of the further processing of meat, poultry, and egg products to assure the safety of the nation's food supply.

The FSIS Science and Technology Program provides analytical, methods development, and other support to all inspection activities. Analytical service support in pathology, chemistry, microbiology, and entomology is provided by the three multidisciplinary laboratories located in Athens, Georgia; St. Louis, Missouri; and Alameda, California. In addition, FSIS maintains a laboratory in Beltsville, Maryland that provides methods development support in microbiology and serology.

Investigations for Reductions of Hazardous Waste in Laboratory Operations: FSIS is investigating novel approaches for the elimination, reduction, or recycling of hazardous waste generated in laboratory or field operations. Activities have specifically targeted the following chemicals whose volume or toxicity are of greatest concern: mercury, silver, petroleum ether, ethanol, and xylene. Efforts have also been directed toward reduction and reuse of organic solvents in FSIS laboratories and field operations. Most recently, FSIS has initiated a program to automate analytical procedures while reducing the use or generation of toxic or hazardous materials. This program is designed to acquire new or modified technology (equipment or procedures) and evaluate its effectiveness and applicability in the operations of a regulatory laboratory.

Current projects include:

- **Protein Determination:** A Leco 2000 Nitrogen Analyzer was purchased to investigate the application of combustion analysis to protein determination. The unit should replace the current

Kjeldahl technology, which generates both acidic and mercuric sulfide waste.

- **Fat Extraction:** FSIS has purchased a Supercritical Fluid Extraction unit to investigate the replacement of the current use of solvents (petroleum ether) for fat extraction from meat and poultry samples.
- **Salt Analyses:** The current salt analysis generates a silver containing nitric acid waste liquid. A capillary electrophoresis instrument was acquired to potentially replace this method. Future studies will investigate the use of CE technology in other HPLC methodologies.
- **Solvent Recycling:** The FSIS laboratories have each acquired solvent distillation units to recover spent xylene and ethanol solvents from histopathology activities. Applications for use with other operations are being investigated.

Amount of funding available for chemical industry-related R&D:

In FY 94, approximately \$150 thousand was obligated within FSIS. In FY 95, approximately \$200 thousand will be obligated.

Length of involvement in chemical industry-related R&D efforts:

FSIS has been involved in the application of pollution prevention/source reduction principles in agency operations for over 10 years.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.

Date of last revision: August 21, 1995.

U.S. Department of Agriculture
Forest Service, Forest Products and Harvesting Research
P.O. Box 96090
Washington, DC 20090-6090

Contact: Dr. Howard Rosen
Phone: 202-205-1565
Fax: 202-205-2497
E-mail: FAWA/S-H.ROSEN/OU1-W01C@MHS.ATTMAIL.COM

Description of agency involvement in chemical industry-related R&D:

As a subset of the Forest Service mission to achieve quality land management under the sustainable multiple-use management concept to meet the diverse needs of people, Forest Products and Harvesting Research seeks to provide the scientific information and technology to harvest, produce, and use wood products in ways that are efficient, safe, and environmentally beneficial.

The primary areas of chemical industry related R&D emphasize the pulping processes, recycling of wastepaper and waste wood to paper and high-valued composite products, adhesives, bioprocessing, bioremediation, fire retardance for wood-based products, preservation, wood finishing, drying, renewable energy fuels, and recovery of wood-based chemicals. The Forest Service currently has 13 project groups (with over 30 projects) in these areas. Sample projects include:

- Adhesives from renewable resources (Pineville, LA)
- Bioremediation of contaminated soils (Madison, WI)
- Biopulping (Madison, WI)
- Composite processing from recycled wood and plastic raw materials (Madison, WI)
- Fermentation of wood hydrolysates (Madison, WI)
- Penetration of wood-based preservatives (Carbondale, IL)
- VOC-compliant coatings for wood materials (Madison, WI)

Amount of funding available for chemical industry-related R&D:

In FY 94, around \$9.7 million was appropriated, and in FY 95, around \$10.1 million was appropriated.

Length of involvement in chemical industry-related R&D efforts:

The Forest Service's forest products research efforts began at the turn of the century but was focused with the establishment of the Forest Products Laboratory in Madison, Wisconsin in 1910. This laboratory, as well as many of the regional locations throughout the United States, has continued to build and expand areas of research related to the chemical industry.

Relationship to OIT programs (if applicable):

The Forest Service is currently working with OIT in approaches to non-chlorine bleaching to reduce contaminants in the effluents from pulp mills.

Notes:

Sources of information: Personal communication.

Date of last revision: August 16, 1995.

DEPARTMENT OF COMMERCE

The Department of Commerce encourages, serves, and promotes the Nation's international trade, economic growth, and technological advancement. Within this framework and together with a policy of promoting the national interest through the encouragement of the competitive free enterprise system, the Department provides a wide variety of programs. It offers assistance and information to increase America's competitiveness in the world economy; administers programs to prevent unfair foreign trade competition; provides social and economic statistics and analyses for business and government planners; provides research and support for the increased use of scientific, engineering, and technological development; works to improve our understanding and benefits of the Earth's physical environment and oceanic resources; grants patents and registers trademarks; develops policies and conducts research on telecommunications; provides assistance to promote domestic economic development; promotes travel to the United States by residents of foreign countries; and assists in the growth of minority businesses.

Federal Agencies Active in Chemical Industry-Related R&D

U.S. Department of Commerce
Bureau of the Census
Center for Economic Studies, EPCD
Room 1587, FB 3
Washington, DC 20233-6101

Contact: Ms. Mary L. Streitwieser
Phone: 301-457-1837
Fax: 301-457-1235
E-mail: MSTREITW@CENSUS.GOV

Description of agency involvement in chemical industry-related R&D:

The Office of Industrial Technologies contracted with the Center for Economic Studies to develop a database and software to generate summary information regarding industrial waste emissions and energy usage for detailed SIC industries. A series of reports from the micro database were submitted to OIT, including one on the intensity and distribution of toxic emissions from the chemical industries (5-digit SIC level). Targets for waste reduction were identified.

Amount of funding available for chemical industry-related R&D:

In FY 94, \$205,000 was authorized for this work. No funding was authorized in FY 95.

Length of involvement in chemical industry-related R&D efforts:

This project was initiated in 1991.

Relationship to OIT programs (if applicable): None other than stated.

Notes:

Sources of information: Personal communication.

Date of last revision: August 1, 1995.

U.S. Department of Commerce
Technology Administration
National Institute of Standards and Technology
Advanced Technology Program
Administration Building, Room A430
Gaithersburg, MD 20899

Contact: Mr. Brian Belanger, Deputy Director
Phone: 301-975-3778 (Belanger)
1-800-ATP-FUND (General Information)
Fax: 301-926-9524
E-mail: ATP@MTCF.NIST.GOV

Description of agency involvement in chemical industry-related R&D:

The National Institute of Standards and Technology (NIST) is directed specifically to assist industry in developing technology to improve product quality; to modernize manufacturing processes; to ensure product reliability; and to facilitate rapid commercialization of products based on new scientific discovery. As a non-regulatory agency of the Department's Technology Administration, NIST aids U.S. industry through research and services; carries out selected programs in public health and safety and environmental improvement; and supports the U.S. scientific and engineering research communities through fundamental research.

The advanced technology program is involved in providing grants to all areas of technology. Currently, there are few restrictions regarding the type of projects funded (e.g., military R&D). In FY 95, 12 solicitations were issued, including a general solicitation and a targeted solicitation for catalysis and biocatalysis. A partial listing of chemical industry-related projects from prior years include:

- Development of Improved Functional Properties in Renewable-Resource-Based Biodegradable Plastics (Cargill, Inc)
- Development of Improved Catalysts using Nanometer-Scale Technology (Catalytica, Inc.; Microfluidics International Corp.)
- Dual Purpose Ceramic Membranes (BP Chemicals; Praxair, Inc., Seattle Specialty Ceramics, Inc.; University Of Missouri - Rolla)

Awards from the catalysis and biocatalysis solicitation are as follows:

- Biosynthesis of Monomers (General Electric)
- Breakthrough Process for Direct Oxidation of Propylene to Propylene Oxide (Dow Chemical)
- Breakthrough Technology for Oxidation of Alkanes (Sun Company; Rohm and Haas)
- Computational Methods for Catalyst Design (Phillips Petroleum)
- Continuous Biocatalytic Systems for the Production of Chemicals from Renewable Resources (Genencor International, Eastman Chemical, Electrosynthesis Company, MicroGenomics, Argonne National Laboratory)
- Elastomeric Polypropylene and Elastic Non-wovens Venture (Amoco, Fiberweb North America)
- Polar-Tolerant Organometallic Catalytic Technology for Functionalized Linear Polyolefins (W.R. Grace)
- Tailored Optical Polymers Through a Novel Catalyst System (BF Goodrich, 3M)
- Thin-Film Solid Acid Catalyst for Refinery Alkylation (ABB Lummus Global)

Amount of funding available for chemical industry-related R&D:

In FY 94, \$199.5 million was authorized for all categories (approximately \$85 million for the general solicitation and the remainder for targeted solicitations). In FY 95, an estimated \$25-30 million was allocated for the general solicitation and \$15 was allocated for the catalysis and biocatalysis targeted solicitation. For individual companies, the program can fund up to \$2 million in direct costs over a three year period. Joint venture projects may be funded for up to five years with no funding limit, but have a minimum 50% cost-sharing requirement.

Length of involvement in chemical industry-related R&D efforts:

The Advanced Technology Program began in 1990.

Relationship to OIT programs (if applicable):

The Advanced Technology Program maintains an informal relationship with several OIT programs.

Notes:

Sources of information: *U.S. Government Manual of Federal Agencies.*
 Advanced Technology Program Proposal Preparation Kit.
 Personal communication.
 Internet resources.

Contact for catalysis and biocatalysis solicitation: Linda Beth Schilling
 301-975-2887 (phone)
 301-926-9524 (fax)
 SCHILLIN@MCF.NIST.GOV

Date of last revision: September 22, 1995.

U.S. Department of Commerce
National Institute of Standards and Technology
Chemical Science and Technology Laboratory
Chemistry Building, Rm. A317
Gaithersburg, MD 20899

Contact: Dr. William Koch, Deputy Director
Phone: 301-975-3146
Fax: 301-975-3845
E-mail: KOCH@MCF.NIST.GOV

Description of agency involvement in chemical industry-related R&D:

The mission of the Chemical Science and Technology Laboratory is to perform research in measurement science; develop and maintain measurement methods, standards, and reference data; and develop models for chemical, biomolecular and physical properties and processes. The goals of the laboratory are to (1) establish the laboratory as the pinnacle of the traceability structure for measurement in chemistry, chemical engineering, and biotechnology; (2) assure that U.S. industry has access to accurate and reliable data, models, and predictive algorithms; (3) anticipate and address next generation measurement needs of the nation; and (4) foster the development and implementation of advanced process technologies.

The laboratory is divided into six divisions: Biotechnology; Chemical Kinetics and Thermodynamics; Process Measurements; Surface and Microanalysis Science; Thermophysics; and Analytical Chemistry. In FY 94, the laboratory also had 73 active cooperative research and development agreements (CRADAs) with other organizations.

Amount of funding available for chemical industry-related R&D:

In both FY 94 and FY 95, approximate funding for the laboratory from all sources was \$50 million annually. The laboratory receives substantial funding from other federal agencies and private sector organizations in addition to general funding.

Length of involvement in chemical industry-related R&D efforts:

The laboratory has been involved since its creation in 1991.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: NIST Chemical Science and Technology Laboratory brochure.
Chemical Science and Technology Laboratory 1994 Technical Activities
(NISTIR 5584).
Personal communication.

Division contacts: (all phone numbers are area code 301 and all e-mail at MICF.NIST.GOV)

Biotechnology:	Dr. Lara Powell, 903-2627, POWELL@
Chemical Kinetics and Thermodynamics:	Dr. Sharon Lias, 903-2562, SGL@
Process Measurements:	Dr. Gregory Rosasco, 903-2609, ROSASCOG@
Surface and Microanalysis Science:	Dr. Rance Velapoldi, 903-3917, VELAPOL@
Thermophysics:	Dr. Richard Kayser, 903-2483, KAYSER@
Analytical Chemistry:	Dr. Willie May, 903-3108, WEM@

Date of last revision: August 31, 1995.

U.S. Department of Commerce
National Institute of Standards and Technology
Materials Science and Engineering Laboratory
Bldg. 223, Rm. B309
Gaithersburg, MD 20899

Contact: Dr. Kenneth L. Jewett, Scientific Assistant to the Director
Phone: 301-975-2608
Fax: 301-926-8349
E-mail: KENNETH.JEWETT@NIST.GOV

Description of agency involvement in chemical industry-related R&D:

The Materials Science and Engineering Laboratory (MSEL) seeks to be the central resource within the federal government in support of technology development in advanced materials and advanced processing of materials for application in the civilian economy. The mission of the MSEL is to stimulate the more effective production and use of materials by working with industry in the development and implementation of technology, measurements, and standards.

The MSEL has five operating divisions: Metallurgy, Ceramics, Polymers, Materials Reliability, and Reactor Radiation; along with an Office of Intelligent Processing of Materials.

Projects in various divisions have potential relevance to the chemical industry. Example project titles include:

- Molecular Dynamics of Replacement Refrigerants Encaged in Zeolites (Reactor Radiation)
- Magnetic Refrigeration (Metallurgy)
- Ultrasonic Characterization of Materials (Materials Reliability)
- Pressure Dependence of the Phase Behavior of Polymer Blends (Polymers)

Amount of funding available for chemical industry-related R&D:

The budget for the MSEL in FY 94 was \$62.5 million, and in FY 95 the budget was \$66.6 million.

Length of involvement in chemical industry-related R&D efforts:

The MSEL has been involved in related efforts since its inception.

Relationship to OIT programs (if applicable):

OIT contributed to a project entitled *Intelligent Processing of Rapidly Solidified Metal Powders*.

Notes:

Sources of information: Personal communication.
Materials Science and Engineering Laboratory 1994 Annual Report (NISTIR 5577).
Other MSEL Technical Activity 1994 reports.
Internet resources.

Date of last revision: September 12, 1995.

 

DEPARTMENT OF DEFENSE

The Department of Defense is responsible for providing the military forces needed to deter war and protect the security of our country. Under the President, who is also Commander in Chief, the Secretary of Defense exercises authority, direction, and control over the Department, which includes the separately organized military departments of the Army, Navy, and Air Force, the Joint Chiefs of Staff providing military advice, the unified combatant commands, and various defense agencies established for specific purposes.

U.S. Department of Defense
Advanced Research Projects Agency
Defense Sciences Office
3701 North Fairfax Drive
Arlington, VA 22203-1714

Contact: Dr. Lawrence H. Dubois
Phone: 703-696-2283
Fax: 703-696-2201
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Description of agency involvement in chemical industry-related R&D:

The Defense Sciences Office (DSO) is the most technically diverse office of the Advanced Research Projects Agency (ARPA), funding research and development on optical, electromagnetic, and structural materials and processing; advanced energy and environmental technologies; applied and computational mathematics; and defense health care technologies.

Primary areas of chemical industry-related R&D emphasize the development of advanced membranes, solid oxide electrolytes, and catalysts for fuel cells; high conductivity polymer electrolytes for batteries; the development of erosion/corrosion resistant coatings; environmentally conscious methods of electronics systems manufacturing; and advanced waste destruction/reclamation technologies. DSO is funding approximately 40 projects in these areas. Sample project titles and participants include:

- Development of Direct Methanol Oxidation Fuel Cells (Jet Propulsion Laboratory, Giner, Inc., International Fuel Cells, Case Western Reserve University)
- Li and Li-ion Battery Development (SAFT America, Ultralife, Electrofuel, A.D. Little, Alliant, University of Minnesota)
- Replacements for Electroplated Hard Chrome (BIRL/Northwestern)
- Advanced Processing of Printed Wire Boards (DuPont, Georgia Tech, IBM, Microelectronics and Computer Technology Corp., Microelectronics Center of North Carolina)
- Reclamation of Cured Fiber Composites (Adherent Technologies)
- Hydrothermal Oxidation of Waste Materials (General Atomics, Foster-Wheeler, Stone & Webster)
- Environmental Sensors (Loral, Hughes, General Atomics, Teledyne, Rockwell)

Amount of funding available for chemical industry-related R&D:

In FY 94, around \$40 million was authorized, and in FY 95, around \$32 million was authorized.

Length of involvement in chemical industry-related R&D efforts:

The materials chemistry, advanced energy, and environmental technologies programs were begun at ARPA in early 1988.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.

Date of last revision: July 26, 1995.

U.S. Department of Defense
Advanced Research Project Agency
Technology Reinvestment Project
3701 North Fairfax Drive
Arlington, VA 22203

Contact: Mr. H. Lee Buchanan III, Director
Phone: 703-696-2237 (Buchanan)
800-DUAL-USE (General Information)
Fax: 703-696-2201
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The Technology Reinvestment Project (TRP) is a six-agency, dual-use technology investment effort that includes the Departments of Defense (Advanced Research Projects Agency, Army, Navy, Air Force), Commerce, Energy and Transportation, the National Science Foundation and the National Aeronautics and Space Administration. It was formed to execute eight statutory programs enacted by Congress in the Defense Technology Conversion, Reinvestment, and Transition Act of 1992. These eight programs have common requirements, including participation by "partnerships," cost sharing between those partnerships and the Federal Government, and a focus on assisting small businesses and Defense-dependent businesses. It is the continuing mission of the TRP to stimulate the transition to a growing, integrated, national industrial capability which provides the most advanced, affordable, military systems and the most competitive commercial products. The TRP fulfills its mission through the application of Defense and commercial resources to develop dual-use technologies, to deploy manufacturing and technology assistance to small firms, and to establish education and training programs that enhance U.S. manufacturing skills and target displaced Defense industry workers.

The FY 95 solicitation requests Technology Reinvestment Project (TRP) Technology Development and Small Business Innovation Research (SBIR) Phase I proposals in the following dual use technology focus areas: (1) Affordable Advanced Controls Technologies, (2) Affordable Polymer Matrix Composites For Airframe Structures, (3) Biological Sensors And Multi-Organ Diagnostic Screening, (4) Digital Wireless Communications And Networking Systems, (5) Operations Other Than War/Law Enforcement, (6) Small Precision Optics Manufacturing Technology, (7) Microelectromechanical Systems Applications, and (8) Other: All proposals in areas other than 1-7 will be competed as a separate, highly competitive category. Awards from the FY 94 solicitation include projects from a focus area on environmental sensors:

- E-SMART System for In-Situ Detection of Environmental Contaminants (General Atomics, Air Force/Armstrong Lab, Georgia Tech, Isco, Photonic Sensor Systems, Science & Engineering Analysis)
- Volatile Organic Compound Sensors, Communications, Processing, and Display (Hughes Aircraft, AAI-ABTECH, GM Hughes Electronics Research Laboratories, University of Pennsylvania)
- UV DIAL Lidar (OCA Applied Optics, Los Alamos Science)
- Field-Deployable, Continuous Monitoring Mass Spectrometer (Teledyne Electronic Technologies; Oak Ridge National Lab; Monsanto; Phillips Petroleum; Scientific Instrument Services; Synergist)
- IMAS: An Intelligent Modular-Array System for the Monitoring of VOCs in the Environment (Tektronix; Battelle, Pacific Northwest Lab; Sandia National Lab; Sawtek)

Amount of funding available for chemical industry-related R&D:

In FY 94, about \$200 million of awards were made. In FY 95, available funds for Technology Development and SBIR Phase I projects were around \$160 million and \$10 million, respectively.

Length of involvement in chemical industry-related R&D efforts:

The first TRP solicitation occurred in FY 93.

Relationship to OIT programs (if applicable):

DOE is one of five non-DOD agencies administering projects awarded by the TRP. OIT has administered a project with the Maine Metal Products Association.

Notes:

Sources of information: Personal communication.
 Internet resources.

Date of last revision: September 7, 1995.

U.S. Department of Defense
Department of the Air Force
Office of Scientific Research
Directorate of Chemistry and Life Sciences
110 Duncan Ave., Suite B115
Bolling Air Force Base, DC 20332-0001

Contact: Dr. Mike Berman
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E-mail: BERMAN@AFOSR.AF.MIL

Description of agency involvement in chemical industry-related R&D:

The Office of Scientific Research directs the Air Force's entire basic research program. Through grants to university scientists, contracts for industry research, cooperative agreements, and support for basic research in Air Force Laboratories, the office funded approximately 1,300 grants and contracts in FY 94, totaling more than \$200 million to about 350 academic institutions and industrial firms.

The Chemistry and Life Sciences Directorate within the Office of Scientific Research has programs in the following areas:

• Chemical Reactivity and Synthesis	• Polymer Chemistry
• Inorganic Materials Chemistry	• Theoretical Chemistry
• Molecular Dynamics	• Neuroscience
• Chronobiology	• Perception and Recognition
• Spatial Orientation	• Cognition
• Bioenvironmental Sciences	• Organic Matrix Composites.

Amount of funding available for chemical industry-related R&D:

In FY 94, available related funding was approximately \$23.1 million, and in FY 95, available related funding was approximately \$23.4 million.

Length of involvement in chemical industry-related R&D efforts:

The directorate has been involved in chemical industry-related efforts for over 30 years.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Research Interests and Broad Agency Announcement 95-1 of the Air Force Office of Scientific Research (AFOSR Pamphlet 70-1).
Internet resources.

Date of last revision: September 8, 1995.

Federal Agencies Active in Chemical Industry-Related R&D

U.S. Department of Defense
Department of the Air Force
Small Business Innovation Research Program
HQ AFMC/STXB
Chidlaw Street, Suite 6
Wright-Patterson Air Force Base, OH 45433-0336

Contact: Ms. Jill Dickman, Air Force SBIR/STTR Program Executive
Phone: 800-222-0336
Fax: 513-476-1086
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The Air Force Small Business Innovation Research (SBIR) program funds Phase I research up to \$100 thousand and Phase II research up to \$750 thousand for qualified small businesses. SBIR contracts are awarded competitively based on scientific and technical merit. Air Force SBIR topics come from an extensive national resource of four major Air Force laboratories along with a number of smaller research centers and logistics organizations located throughout the United States. Sample topics areas for the FY 96 solicitation include:

- Thermal-Barrier and Corrosion-Protective Nano- and Micro-Laminated Ceramic Coatings
- Software for Computational Chemistry
- Chemical Reactor Technology
- Low-Temperature Treatment Technologies for Dilute Gaseous Effluents
- Volume Reduction of Aircraft Depainting Wastes
- Remediation Technology for Low Hydraulic Conductivity Soils
- Treatment of Trichloroethylene Using Dual Co-Substrates
- Role of Iron in Anaerobic Degradation of Fuel Hydrocarbon

Amount of funding available for chemical industry-related R&D:

In FY 93, the Air Force SBIR budget was over \$130 million.

Length of involvement in chemical industry-related R&D efforts:

The SBIR program was created in 1982.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: *Air Force SBIR, An Opportunity for Small Business.*
Internet resources.

Date of last revision: September 29, 1995.

U.S. Department of Defense
Department of the Army
Army Research Laboratory
AMSRL-TT-TA
2800 Powder Mill Rd.
Adelphi, MD 20783-1197

Contact: Mr. R. Michael Claffy
Phone: 301-394-3098
Fax: 301-394-5818
E-mail: MCLAFFY@ARL.MIL

Description of agency involvement in chemical industry-related R&D:

The Army Research Laboratory was created as a result of the Base Realignment and Closure 91 Commission recommendation and subsequent Congressional and Presidential approval. The lab consists of 12 directorates, including 11 technology-oriented directorates, located at several geographic sites throughout the country.

The materials directorate has areas of expertise in adhesives, polymers/plastics, coatings, and corrosion prevention, among other items. Other directorates have expertise in other areas. Sample technology transfer opportunities include:

- Advanced Engine Thermoplastics
- Aerosol Diagnostics Using Laser-Based Methods
- Coatings Resistant to Chemical Agents
- Halon Alternatives for Fire Suppression
- Soldering Without Flux.

In addition, the lab also operates the Army's Small Business Innovation Research (SBIR) program.

Amount of funding available for chemical industry-related R&D:

The total R&D budget for the lab was \$283 million in FY 95.

Length of involvement in chemical industry-related R&D efforts: Unknown.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Internet resources.

Date of last revision: September 29, 1995.

U.S. Department of Defense
Department of the Army
Army Research Office
Chemical and Biological Sciences Division
P.O. Box 12211
Research Triangle Park, NC 27706-2211

Contact: Dr. Robert Shaw, Director
Phone: 919-549-4293
Fax: 919-549-4288
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The Army Research Office is responsible for basic research efforts in support of the Army and its requirements. Programs included efforts in biochemistry, polymer chemistry synthesis, electrochemistry, colloid chemistry, organic chemistry, and physical chemistry.

Amount of funding available for chemical industry-related R&D:

In FY 94, approximately \$9 million was authorized for chemistry research efforts.

Length of involvement in chemical industry-related R&D efforts:

The Army Research Office has been involved in similar efforts for several decades.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.

Date of last revision: September 29, 1995.

U.S. Department of Defense
Department of the Navy
Office of Naval Research
800 North Quincy Street
Arlington, VA 22217-5660

Contact: Dr. Ronald A. DeMarco
Phone: 703-696-5075
Fax: 703-696-6887
E-mail: DEMARCR@ONRHQ.ONR.NAVY.MIL

Description of agency involvement in chemical industry-related R&D:

The Office of Naval Research supports basic research, exploratory development and technology development research efforts in support of the missions required of the Navy and Marine Corps. Chemical research is focused at universities, Navy centers, and industrial laboratories.

Primary areas of chemical research are focused on synthesis and characterization of new compounds/precursors and understanding kinetics and mechanisms relating to chemical processes of interest. Areas of research are limited to Physical Chemistry, Polymer Chemistry, Solid State and Surface Chemistry, Electrochemical Sciences and Technology, and Organic Chemistry. The Office of Naval Research currently funds approximately 180 research efforts in areas focusing on:

• Chemistry/physics of sliding contact	• Membranes
• Optoelectronic polymers	• Electrostrictive polymers
• Small domains	• Advanced processing
• Chemical compatibility	• Polymer surface science
• Organometallic routes to new materials	• Interfacial structure and dynamics
• Marine bioadhesives/fouling release coatings	• New electrode materials
• Molecular-level understanding of lubrication	• Thin-/ultra-thin film science
• Chemical interfaces	• Supramolecular assemblies/devices

Amount of funding available for chemical industry-related R&D:

The Office of Naval Research provided approximately \$30 million for support of basic research efforts in chemistry in FY 94 and FY 95.

Length of involvement in chemical industry-related R&D efforts:

The office was established by Congress in 1946. Basic research in chemistry has been supported over the years; current applications of chemical systems to Navy-relevant areas, such as acoustic materials, electronic materials, semi-superconductor materials, minimally adhesive materials, IR materials, polymer composites, power sources, tribiology, adhesion, and thin-film growth are under investigation.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.

Date of last revision: September 27, 1995.

U.S. Department of Defense
Department of the Navy
Office of Naval Research
Small Business Innovation Research Program
800 N. Quincy St., ONR 362 SBIR
Arlington, VA 22217-5660

Contact: Mr. Vincent Schaper, Program Officer
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E-mail: SCHAPERV@ONRHQ.ONR.NAVY.MIL

Description of agency involvement in chemical industry-related R&D:

Through the Department of the Navy's Small Business Innovation Research (SBIR) Program, small businesses have the opportunity to address naval needs in more than 30 science and technology areas. SBIR provides the fleet with innovative advances in technology developed by small firms that have the courage, drive, and flexibility to assume risks, develop niches, and generally compete in areas less attractive to larger firms. SBIR participants benefit both from program awards as well as the further development and commercialization of the resulting products.

Special consideration is given to research topics that further one of more of the following critical technologies, as identified by the National Critical Technologies Panel.

Science	Technology
Computer Sciences	Aerospace Propulsion and Power
Mathematics	Aerospace Vehicles
Cognitive and Neural Sciences	Chemical and Biological Defense
Biology and Medicine	Command Control and Communication
Terrestrial Sciences	Computers
Atmospheric and Space Sciences	Conventional Weapons
Ocean Sciences	Electron Devices
Chemistry	Electronic Warfare
Physics	Environmental Quality and Engineering
Electronics	Human-System Interface
Materials	Manpower and Personnel
Mechanics	Materials and Structures
Environmental Sciences	Medical
Manufacturing Sciences	Sensors
	Surface/Undersurface Vehicles
	Software
	Training Systems

The program receives topics from various parts of the Navy in science and technology areas. Over 100 topics were solicited in both FY 94 and FY 95. Sample topic areas for FY 95 include:

- Biofilters for Reduction of Gaseous Emissions
- Modeling Characteristics for Volumetric Explosives
- Near Infrared Fluorophores for Advanced Array Biosensors

Sample awards from FY 94 include:

- Novel Membrane-Based System for Shipboard Treatment of Gray-Water and Oily Waste Water
- Low-Cost Chemically Bonded Ceramic Prototype Tooling for Fabrication of Composites
- Deterioration Sensors of Hazardous Material Containers
- Electrochemical Concentration and Purification of Spent Sodium Bicarbonate Blasting Media
- Advanced Membrane System for Graywater Treatment

Amount of funding available for chemical industry-related R&D:

Total funding for all areas of the Navy SBIR in FY 95 was \$101 million.

Length of involvement in chemical industry-related R&D efforts:

The Navy has been participating in SBIR solicitations since the early 1980s.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
 Internet resources.

Date of last revision: August 11, 1995.

U.S. Department of Defense
Strategic Environmental Research and Development Program
SERDP Program Office
901 N. Stuart St., Ste. 303
Arlington, VA 22203

Contact: Ms. Amy Levine
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Fax: 703-696-2114
E-mail: ALEVINE@NS1.SERDP.GOV

Description of agency involvement in chemical industry-related R&D:

The Strategic Environmental Research and Development Program (SERDP) is a Congressionally mandated program (Public Law 101-510) addressing environmental matters of concern to the Department of Defense (DOD) and the Department of Energy (DOE). The program is jointly managed by DOD, DOE, and the Environmental Protection Agency, with participation by other federal agencies.

Among other activities, the program provides for the identification and support of programs of basic and applied research, development, and demonstration of technologies useful to:

- facilitate environmental compliance, remediation, and restoration activities;
- minimize waste generation, including reduction at the source;
- substitute use of nonhazardous, nontoxic, nonpolluting, and other environmentally sound materials and substances;
- provide for the identification and support of research, development, and application of other technologies developed for national defense purposes;
- conduct joint research, development, and demonstration projects relating to innovative technologies, management practices, and other approaches; and
- provide for the identification of, and planning for the demonstration and use of, existing environmentally sound, energy-efficient technologies developed by the private sector.

The program currently has six major thrust areas: cleanup, compliance, conservation, energy conservation/renewable resources, global environmental change, and pollution prevention. By FY 97, the global environmental change and energy conservation/renewable resources areas will be eliminated. In FY 94, the program funded approximately 125 projects in all areas. Sample project titles include:

- Removal of VOCs from Contaminated Groundwater and Soils by Pervaporation
- Catalytic In Situ Treatment of Chlorinated Solvents
- Supercritical Water Oxidation of Organic Wastes
- Clean Liquid Fuel from Biomass and Carbonaceous Wastes
- Life Cycle Engineering and Design Program
- Solvent Substitution and Low VOC Cleaners
- Chemistry of Halon Substitutes
- Continuous Aqueous Cleaning to Eliminate Ozone-Depleting Compounds
- Non-Ozone Depleting Refrigerants for Navy Chillers

Amount of funding available for chemical industry-related R&D:

The FY 93 appropriation for the SERDP was \$180 million, the FY 94 appropriation for the SERDP was \$160 million, and the FY 95 appropriation was \$61.9 million.

Length of involvement in chemical industry-related R&D efforts:

The SERDP was enacted by Public Law 101-510 in 1990.

Relationship to OIT programs (if applicable):

The Department of Energy and several of the national laboratories are participating in the program.

Notes:

Sources of information: Personal communication.
 1994 Annual Report and Five-Year (1994-1998) Strategic Investment
 Plan, Strategic Environmental Research and Development Program.

Other contact: Mr. Blake Henke, SERDP Support Office, 703-506-1400

Date of last revision: August 23, 1995.

DEPARTMENT OF ENERGY

The Department of Energy provides the framework for a comprehensive and balanced national energy plan through the coordination and administration of the energy functions of the Federal Government. The Department is responsible for long-term, high-risk research and development of energy technology; the marketing of Federal power; energy conservation; the nuclear weapons program; energy regulatory programs; and a central energy data collection and analysis program.

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Office of Industrial Technologies
EE-20
1000 Independence Ave. SW
Washington, DC 20585

Contact: Mr. Bruce Cranford, OIT Chemical Industry Team Leader
Phone: 202-586-9496
Fax: 202-586-3237
E-mail: BRUCE.CRANFORD@HQ.DOE.GOV

Description of agency involvement in chemical industry-related R&D:

The Office of Industrial Technologies (OIT), through partnerships with industry, government, and non-governmental organizations, develops and delivers advanced energy efficiency, renewable energy, and pollution prevention technologies for industrial applications. Primary areas of chemical industry-related R&D emphasize increasing chemical conversion efficiency, reducing fossil fuel dependence, reducing waste product generation, increasing conversion and recycling of waste products, and better utilizing waste heat. The Office of Industrial Technologies is currently funding approximately 45 projects in these areas. Sample project titles include:

- Bioprocessing (Oak Ridge National Laboratory, Dow, 3M, AlliedSignal)
- Inorganic Polymer Membranes (Idaho National Engineering Laboratory, Union Carbide, Media and Process Technology)
- Auto Shredder Residue (Argonne National Laboratory, Alter Trading Co.)
- Carpet Waste to Caprolactam (National Renewable Energy Laboratory, AlliedSignal)
- Biomass to Lactic Acid (National Renewable Energy Laboratory, Golden Technologies Company)
- Novel Selective Surface Flow Membranes (Air Products and Chemicals)
- Alternative Feedstocks (Argonne National Lab, Idaho National Engineering Lab, National Renewable Energy Lab, Oak Ridge National Lab, Pacific Northwest Lab)

In addition, OIT also funds research through the National Industrial Competitiveness through Energy, Environment, and Economics (NICE³) Program, which is a joint grant program between the Department of Energy and the Environmental Protection Agency. The overall goal of the NICE³ Program is to improve industrial energy efficiency, reduce industry's costs, and lower emissions to the environment. The program solicits projects annually, and provides grants which fund up to 50% of the total project cost, with a maximum award of around \$400,000. The chemical industry (SIC 28) is a priority area for the program. The program has funded around 40 projects since its inception. Sample project titles from previous solicitations and participants include:

- Ultrasonic Tank Cleaning (DuPont Merck, New Jersey Dept. of Energy and Environmental Protection)
- Reclaim and Reuse Waste Water (PPG Industries, Ohio Dept. of Development)
- Methanol Recovery Process (FMC Corp., Texas Water Commission)
- Use of Recovered Plastics in Manufacturing of Durable Goods (MBA Polymers, California Energy Commission)
- Fuel-Based Nitrogen Generator (Industrial Gas Technologies Commercialization Center, Ohio Dept. of Development)

Also, OIT's Petroleum Refining Team conducts research in the areas of novel process development, process modeling, catalysis, and separations. Finally, OIT has many other programs that fund research in such areas as advanced materials, heat exchangers, and cogeneration.

Amount of funding available for chemical industry-related R&D:

In FY 1995, approximately \$23 million has been authorized by OIT for chemical industry efforts. The NICE³ program made awards of approximately \$4.6 million in FY 95.

Length of involvement in chemical industry-related R&D efforts:

OIT was formed in 1976. The chemical industry has been a focal point since its formation due to the high energy use and intensity of the chemical industry. The NICE³ program began in 1991.

Relationship to OIT programs (if applicable): n/a.

Notes: (all area code 202 and e-mail at HQ.DOE.GOV)

Other OIT Chemical Industry Team members:

- David Boron, 586-0080, DAVID.BORON@
- Doug Gish, 586-1741, DOUG.GISH@
- Ehr-Ping Huang Fu, 586-1493, EHR-PING.HUANGFU@
- Gloria Kulesa, 586-8091, GLORIA.KULESA@
- Stuart Natof, 586-2370, STUART.NATOF@
- Charles Russomanno, 586-7543, CHARLES.RUSSOMANNO@
- Alan Schroeder, 586-1641, ALAN.SCHROEDER@ (also the NICE³ contact)
- Brian Volintine, 586-1739, BRIAN.VOLINTINE@

Petroleum Refining Team Contact:

- Dan Wiley, 586-2099, DAN.WILEY@

Other OIT Contacts:

- Tom Foust, 586-0198, TOM.FOUST@ (Forest Products Team)
- Doug Kaempf, 586-5264, DOUG.KAEMPF@ (Metals Casting Team)
- Susanne Leonard, 586-6108, SUSANNE.LEONARD@ (Glass Team)
- Matt McMonigle, 586-2082, MATT.MCMONIGLE@ (Aluminum Team)
- Scott Richlen, 586-2078, SCOTT.RICHLIN@ (Steel Team)
- Simon Friedrich, 586-6759, SIMON.FRIEDRICH@ (Municipal Solid Waste)
- Stan Blazewicz, 586-4679, STAN.BLAZEWICZ@ (Cogeneration)
- Charles Sorrell, 586-1514, CHARLES.SORRELL@ (Advanced Materials)
- Gideon Varga, 586-0082, GIDEON.VARGA@ (Combustion)
- Frank Wilkins, 586-1684, FRANK.WILKINS@ (Solar Industrial)
- Theo Johnson, 586-6937, THEODORE.JOHNSON@ (Sensors)
- Paul Scheihing, 586-7234, PAUL.SCHEIHING@ (Motor Challenge)
- Chuck Glaser, 586-1298, CHARLES.GLASER@ (Industrial Assessment Centers)
- Lisa German, 586-2487, LISA.GERMAN@ (Technology Transfer)

Date of last revision: September 7, 1995.

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Office of Building Technologies, EE-422
1000 Independence Ave. SW
Washington, DC 20585

Contact:	Mr. William Noel (refrigerants)	Mr. Ronald Fiskum (absorption fluids)
Phone:	202-586-6149	202-586-9154
Fax:	202-586-1628	202-586-1628
E-mail:	WILLIAM.NOEL@HQ.DOE.GOV	RONALD.FISKUM@HQ.DOE.GOV

Description of agency involvement in chemical industry-related R&D:

The Office of Building Technologies (OBT) operates a strategic array of programs, including research and development of advanced technologies and construction practices; collaborative programs with industry and consumers to deploy high-efficiency technologies into the commercial and residential markets; and national standards for appliances and buildings to ensure that they meet minimum energy efficiency levels. Research areas include lighting (e.g., sulfur lamps), advanced insulation (e.g., evacuated powder panels), windows (e.g., argon or krypton filled double-pane), and appliances (e.g., refrigerators and heat pumps).

The primary emphasis on chemical industry-related research within OBT is the replacement of refrigerants (and insulation blowing agents) containing chlorofluorocarbons (CFCs), and development of advanced absorption fluids for thermally activated heat pumps. CFC alternatives research covers materials compatibility and properties with chlorine-free (hydrofluorocarbons) refrigerants, blends, and lubricants. Absorption fluids research involves analysis and testing of novel quaternary ammonia-based and multi-component water-based fluids for heat pumps.

Amount of funding available for chemical industry-related R&D:

Approximately \$2.9 million was authorized for these efforts in FY 94, and approximately \$2.4 million was authorized for these efforts in FY 95.

Length of involvement in chemical industry-related R&D efforts:

The Office of Building Technologies has been involved in chemical industry-related research activities since the early 1980's.

Relationship to OIT programs (if applicable):

OBT and OIT are located within the same parent organization in DOE.

Notes:

Sources of information: Personal communication.

Date of last revision: August 16, 1995.

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Office of Transportation Technologies, EE-30
1000 Independence Ave. SW
Washington, DC 20585

Contact: Mr. John Ferrell
Phone: 202-586-6745
Fax: 202-586-9815
E-mail: JOHN.FERRELL@HQ.DOE.GOV

Description of agency involvement in chemical industry-related R&D:

The Biofuels Systems Division conducts research, development and demonstration activities geared toward the commercialization of clean biomass-based alternative fuels to displace petroleum-derived fuels for use in the transportation sector. The program supports technology development in two specific areas; biomass feedstock preparation and conversion of feedstocks to transportation fuels including ethanol, methanol, reformulated gasoline components, biocrude derivatives and biodiesel.

The Biofuels Systems Division currently funds a strong in-house research effort which is being conducted at two national labs, as well as approximately 70 subcontracts at numerous university and industrial laboratories and consortia throughout the country and the program supports work in three Cooperative Research and Development Agreements (CRADAs) with industry. The R&D activities included laboratory bench scale research as well as pilot scale activities. Sample project titles and participants include:

- Fermentation Technology: Strain Development (National Renewable Energy Laboratory, Purdue University, University of Wisconsin)
- Process Applications: Develop Alternative Pretreatment Methods (National Renewable Energy Laboratory, Colorado State University, Purdue University, University of California, Auburn University)
- Biocrude Testing (National Renewable Energy Laboratory, University of Utah, University of Iowa)
- Populus Physiology and Biotechnology (Oak Ridge National Laboratory, U.S. Department of Agriculture-North Carolina Forest Experimental Station)

Amount of funding available for chemical industry-related R&D:

In FY 94, approximately \$35 million was authorized, and in FY 95, approximately \$34 million was authorized.

Length of involvement in chemical industry-related R&D efforts:

The Biofuels Systems Division of the Office of Transportation Technologies has focused on the production of cleaner burning, domestically produced biomass derived transportation fuels for the past decade. Biomass to ethanol has been determined to have the best near term potential, particularly for the oxygenate markets, with peat fuels as a longer term goal.

Relationship to OIT programs (if applicable):

The Biofuels Systems Division of the Office of Transportation Technologies, along with the Alternative Feedstock Division of the Office of Industrial Technologies, coordinated funding of the Consortium for Plant Biotechnology Research in FY 95, broadening the support for Energy from Biomass to include support of chemicals produced from Biomass feedstocks. The two programs maintain communication on program direction and projects that are of mutual interest.

Notes:

Sources of information: Personal communication.

Date of last revision: August 1, 1995.

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Office of Utility Technologies, EE-142
1000 Independence Ave. SW
Washington, DC 20585

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Description of agency involvement in chemical industry-related R&D:

The Office of Utility Technologies (OUT) leads the federal government's effort to help America's electric power producers develop clean, renewable, and more economical forms of energy. The office's Hydrogen Program, within the Advanced Utility Concepts Division, is partnering with industry through direct cost-share and cooperative research and development agreements (CRADAs) with the national laboratories to develop hydrogen production, storage, transportation, and utilization technologies for the future use of hydrogen as an energy carrier and fuel.

The early markets for hydrogen are as an industrial gas, in fertilizer and chemical production and in the upgrade of petroleum products. The Hydrogen Program has placed priority on hydrogen production and storage R&D projects. Although the program's goals are the use of hydrogen as an energy carrier and fuel, there are existing production and storage projects which are chemical-industry related in the present hydrogen market. Projects and participants include:

- Sorption Enhanced Reaction Process for Production of Hydrogen (Air Products and Chemicals)
- Conversion of Municipal Solid Waste to Hydrogen (Lawrence Livermore National Laboratory, Texaco)
- Solar Photochemical Production of HBr from Bromine and Steam for Off-Peak Electrolytic Hydrogen Production (Solar Reactor Technologies)
- Photoelectrochemical Hydrogen Production (University of Hawaii, National Renewable Energy Laboratory, Energy Conversion Devices, Solarex)
- Development of Solid Electrolytes for Water Electrolysis at Higher Temperatures (Florida Solar Energy Center)
- Biomass to Hydrogen via Fast Pyrolysis and Catalytic Steam Reforming (National Renewable Energy Laboratory)
- Improved Metal Hydride Technology for the Storage of Hydrogen (Energy Conversion Devices, University of Michigan, Engineering Consultants)
- Hydrogen Transport and Storage in Engineered Microspheres (Lawrence Livermore National Laboratory, W.J. Schafer Associates)
- Polyhydride Complexes for Hydrogen Storage (University of Hawaii)
- Microporous Materials for Hydrogen Storage (Sandia National Laboratories, Westvaco, Amoco)

Amount of funding available for chemical industry-related R&D:

In both FY 94 and FY 95, about \$10 million was authorized annually for the Hydrogen Program.

Length of involvement in chemical industry-related R&D efforts:

DOE has sponsored hydrogen-related research since the early 1970's. The current Hydrogen Program was authorized in 1990 by the Spark M. Matsunaga Hydrogen Research, Development and Demonstration Act.

Relationship to OIT programs (if applicable):

OIT supports several hydrogen production projects and participates in the Hydrogen Energy Coordinating Committee. Also, OIT and OUT are located in the same parent organization at DOE.

Notes:

Sources of information: Personal communication.

Date of last revision: September 12, 1995.

U.S. Department of Energy
Office of Defense Programs
Office of Economic Competitiveness
DP-14
1000 Independence Ave. SW
Washington, DC 20585

Contact: Mr. Tom D'Agostino
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Description of agency involvement in chemical industry-related R&D:

The Office of Economic Competitiveness (DP-14) supports, in cooperation with other organizations, R&D programs that enhance the science and technology base and core competencies necessary to achieve the national security mission and contribute to U.S. industrial competitiveness. Technology partnerships of interest to the chemical industry are in the areas of computer architecture and control, energy efficiency, reducing waste product generation and improvements in safety, health and monitoring. The Office of Economic Competitiveness is currently funding approximately 30 projects. Sample project titles and participants include:

- Open Tube Solid Phase Extractor (Los Alamos National Laboratory and Restek Corp.)
- Field-Portable Chemical Analysis Instrument (Pinellas Plant and Life Sciences, Inc.)
- Environmentally Conscious Closed-Loop Aqueous and Semi-Aqueous Cleaning Systems for Defluxing (Kansas City Plant and American Technical Ceramics Corp.)
- Subsurface Flow and Chemical Migration (Lawrence Livermore National Laboratory and International Technologies Corp.)

Amount of funding available for chemical industry-related R&D:

In FY 95, approximately \$11 million is authorized and in FY 96, \$7.5 million is planned.

Length of involvement in chemical industry-related R&D efforts:

The Office of Economic Competitiveness has been involved in technology partnerships with industry and other non-federal organizations since 1991.

Relationship to OIT programs (if applicable):

The interaction between the Office of Economic Competitiveness and the Office of Industrial Technologies has been on a level of information exchange on projects of mutual interest.

Notes:

Sources of information: Personal communication.

Date of last revision: July 12, 1995.

U.S. Department of Energy
Office of Energy Research
Basic Energy Sciences
Advanced Energy Projects Division, ER-33, GTN
1000 Independence Ave. SW
Washington, D.C. 20585

Contact: Dr. Walter M. Polansky, Director
Phone: 301-903-5995
Fax: 301-903-6067
E-mail: WALT.POLANSKY@MAILGW.ER.DOE.GOV

Description of agency involvement in chemical industry-related R&D:

The Division of Advanced Energy Projects (AEP) provides support to explore the feasibility of novel, energy-related concepts that evolve from advances in basic research. These concepts are typically at an early stage of scientific definition and, therefore, are premature for consideration by applied research or technology development programs. The AEP also supports high-risk, exploratory concepts that do not readily fit into a program area but could have several applications that may span scientific disciplines or technical areas.

The Division provides a mechanism for converting basic research findings to applications that eventually could impact the Nation's energy economy. AEP does not support evolutionary research or large scale demonstration projects. Technical topics include physical, chemical, materials, engineering, and biotechnologies. Projects can involve interdisciplinary approaches to solve energy-related problems. Projects supported by the Division arise from unsolicited ideas and concepts submitted by researchers. The portfolio of projects is dynamic and reflects the broad role of DOE in supporting R&D for improving the Nation's energy outlook. FY 94 projects include the following topical areas:

- Novel Materials for Energy Technology
- Renewable and Biodegradable Materials
- Exploring Uses of New Scientific Discoveries
- Alternate Pathways to Energy Efficiency
- Alternative Energy Sources
- Innovative Approaches to Waste Treatment and Reduction

In FY 94, the program was composed of 53 projects, 13 of which were new in FY 94. Sample project titles and participants include:

- Solar Detoxification of Aquatic Systems with Porous Photocatalysts (Brooklyn College of City University of New York)
- Biocatalytic Design by Chemical Modification (Oak Ridge National Laboratory)
- Zeolite Catalysts in Conversion of Cellulosics (Purdue University)
- Cationically Polymerizable Monomers Derived from Renewable Sources (Rensselaer Polytechnic Institute)
- Synthesis of New High Performance Lubricants and Solid Lubricants (University of Texas-Austin)
- Supersonic-Mixing, Shock-Wave Reactor: An Innovative Approach for Efficient Chemical Production (University of Washington)
- Two-Dimensional Synthesis: Ultrathin Porous Membranes (University of Colorado)

Amount of funding available for chemical industry-related R&D:

AEP funding in FY 94 and FY 95 was around \$11 million. Projects are supported for a specified period of time, which typically does not exceed three years. In FY 1994, the average annual funding level for an AEP project was \$299,000. It is expected that, following AEP support, each concept will be sufficiently developed and promising to attract further funding from other sources in order to realize its full potential.

Length of involvement in chemical industry-related R&D efforts:

The Division of Advanced Energy Projects was formed in the early 1980s.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
 Internet resources.

Date of last revision: September 8, 1995.

U.S. Department of Energy
Office of Energy Research
Office of Basic Energy Sciences
Chemical Sciences Division
ER-14
19901 Germantown Rd, MS G236
Germantown, MD 20585

Contact: Dr. Robert Marianelli, Director
Phone: 301-903-5804
Fax: 301-903-4110
E-mail: ROBERT.MARIANELLI@MAILGW.ER.DOE.GOV

Description of agency involvement in chemical industry-related R&D:

The Division of Chemical Sciences supports basic research at universities, DOE national laboratories, and other appropriate organizations for the purpose of providing the knowledge required to develop energy technologies that meet national goals of energy efficiency, public health and safety, environmental protection and restoration, and conservation of natural resources. Projects supported by the Division are selected for relevance to these goals and for scientific excellence as judged by peer review.

In FY 94, the division funded approximately 450 projects. There are eight elements in the division. These elements and their approximate number of projects are as follows: Photochemical and Radiation Sciences (78); Chemical Physics (83); Atomic Physics (46); Chemical Energy (110); Separations and Analysis (61); Heavy Element Chemistry (10); Chemical Engineering Sciences (26); and Advanced Battery Technology (26).

Sample project titles and participants include:

- Organic Photochemical Processes (University of Notre Dame)
- Chemical Structure and Dynamics (Pacific Northwest Laboratory)
- Fluid Catalysis (Argonne National Laboratory)
- Chemical and Physical Principles in Multiphase Separations (Oak Ridge National Laboratory)
- Solid-State, Surface, and Catalytic Studies of Oxides (Northwestern University)
- Mechanisms of Gas Permeation through Polymer Membranes (Syracuse University)

Amount of funding available for chemical industry-related R&D:

In FY 94, the Chemical Sciences Division was authorized approximately \$158.9 million. In FY 95, the division was authorized approximately \$159.6 million.

Length of involvement in chemical industry-related R&D efforts:

Research has been conducted for around 25 years with impacts on the chemical industry.

Relationship to OIT programs (if applicable):

No formal programmatic relationship, however, there have been joint planning activities between Energy Research and OIT.

Notes:

Sources of information: Personal communication.
 Summaries of FY 1994 Research in the Chemical Sciences, U.S.
 Department of Energy (DOE/ER--0144/12).
 Internet resources.

Date of last revision: August 21, 1995.

U.S. Department of Energy
Office of Energy Research
Basic Energy Sciences
Energy Biosciences Division, ER-17
19901 Germantown Rd.
Germantown, MD 20874

Contact: Mr. Greg Dilworth, Acting Director
Phone: 301-903-2873
Fax: 301-903-1003
E-mail: GREG.DILWORTH@OER.DOE.GOV

Description of agency involvement in chemical industry-related R&D:

The Energy Biosciences program, earlier termed the Biological Energy Research program, was initiated in 1979 for the purpose of fulfilling the need of basic information about plants and microorganisms relating to varied energy matters. The program generates basic information that contributes significantly to future technologies involving alternate fuel generation, petroleum replacements, sustained industrial activities along with means of improving environmental conditions.

From its inception, the program has covered basic research in the areas of plant and non-medical microbial science including physiology, biochemistry, genetics and other disciplinary approaches in order to gain a better understanding of how organisms function and how they are structured. Topics such as photosynthesis, fermentation, adaptation to natural stress conditions, ion uptake, nitrogen fixation, plant-microbe interactions, genetic regulation, metabolic pathways, transport activities and a myriad of other areas have been included in the investigations sponsored. Some of the plants and microorganisms being studied, unlike certain other species, have not received a great amount of research attention, despite the critical role that such organisms have in nature. In order to achieve the establishment of new biotechnologies, the addition of information emerging from such studies is essential.

As the understanding of biological processes increases, it is becoming clearer that further comprehension will require broader approaches, including multidisciplinary investigations. The fact that the Energy Biosciences program is situated in the Office of Basic Energy Sciences with disciplines including chemistry, materials science, engineering, geosciences and others, facilitates interactions with these other disciplines. Such interactions between programs and scientific disciplines is of growing importance. The Energy Biosciences program has been active in encouraging such interactions.

Energy Biosciences funds research in about 15 areas, and include the following: photosynthesis; plant cell wall development; plant respiration/nutrition/ion transport; plant and plant pigment metabolism; plant growth and development; plant genetic regulation and genetic mechanisms; plant stress; plant-pathogen/viral interactions; nitrogen fixation and plant-microbial symbiosis; lignin-polysaccharide breakdown; fermentation microbial metabolism; one and two carbon microbial metabolism; extremophilic microbes; microbial respiration, nutrition and metal metabolism; and materials biosynthesis. Over 200 projects were funded in FY 94. Sample project titles and participants include:

- Anaerobic Metabolism of Aromatic Compounds by Phototrophic Bacteria: Biochemical Aspects (Cornell University)

- Conversion of Acetic Acid to Methane by Thermophiles (Cornell University)
- Gene-enzyme Relationships of Aromatic Amino Acid Biosynthesis in Higher Plants (University of Florida)
- The Metabolism of Hydrogen by Extremely Thermophilic Bacteria (University of Georgia)
- Microbiology and Biochemistry and Anaerobic Fermentations: The Conversion of Complex Organic Materials to Simple Gases (University of Georgia)
- Molecular Biology of Anaerobic Aromatic Biodegradation (University of Iowa)
- A National Cooperative for Genetic Engineering of Plant Lipids (Michigan State University)
- Genetics of the Sulfate-Reducing Bacteria (University of Missouri)
- Biosynthesis of Hydrocarbons (Ohio State University)

Amount of funding available for chemical industry-related R&D:

The FY 94 budget for Energy Biosciences activities was roughly \$25 million.

Length of involvement in chemical industry-related R&D efforts:

The Biological Energy Research program was formed in 1979.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
 *Annual Report and Summaries of FY 1994 Activities, Division of Energy
 Biosciences (DOE/ER-0621P).*
 Internet resources.

Date of last revision: September 15, 1995.

U.S. Department of Energy
Office of Energy Research
Office of Computational and Technology Research
Small Business Innovation Research (SBIR) Office
ER-33
19901 Germantown Rd.
Germantown, MD 20874-1290

Contact: Dr. Samuel J. Barish, Program Manager
Phone: 301-903-2917
Fax: 301-903-6067
E-mail: SAM.BARISH@MAILGW.ER.DOE.GOV

Description of agency involvement in chemical industry-related R&D:

The Small Business Innovation Research (SBIR) program is mandated by the Small Business Innovation Development Act of 1982 and the Small Business Research and Development Enhancement Act of 1992. Grant applications are solicited from small science- and technology-based U.S. firms (with 500 employees or less). The program is designed for implementation in a three-phase process, with Phase I determining, insofar as possible, the scientific or technical merit and feasibility of ideas proposed for investigation. The period of performance in this initial phase is about six months and awards are currently limited to \$75,000. Phase II is the principal research or R&D effort, and awards are now at a maximum of \$750,000 for work to be performed in a period of up to two years. Under Phase III, commercial applications of the research or R&D are to be pursued by small businesses with non-federal capital or, alternatively, Phase III may involve follow-on non-SBIR federal contracts for products or processes desired by the federal government.

The SBIR office is also responsible for the DOE's Small Business Technology Transfer (STTR) program, now completing its second year, which was established as a three-year pilot program in compliance with the Small Business Research and Development Enhancement Act of 1992. The STTR program is similar to, but smaller than, the SBIR program, except that the R&D is carried out by the small business in collaboration with a non-profit research institution (e.g., government laboratory or university) serving as a subcontractor. The maximum Phase I awards are for \$100,000 for nine months, and Phase II awards are for \$500,000 for two years. The projects supported in both the SBIR and STTR programs represent high-risk research, but the potential benefits are high if the objectives are met.

Areas of chemical industry-related R&D include, but are not limited to, basic research in the chemical and material sciences; more efficient utilization of, and environmental control technology for, fossil energy resources; sensors for process monitoring and control; fuel cells and photovoltaic systems; monitoring and remediation of contaminated media; superconductors; design and applications of novel materials; robotics and remote operations; and nuclear fuel cycle processes.

The SBIR and STTR programs of the DOE are currently funding approximately 140 Phase I and Phase II projects in these areas. Representative project titles include:

- Low Cost Contamination-Tolerant Electrocatalysts for Low-Temperature Fuel Cells
- A New Type of Acoustical Sensor for Chemical Measurements

- A Novel Approach to the Removal of High Concentrations of Nitrate and Nitride from Aqueous Waste Streams
- A Mid-Infrared Laser for Remote Sensing of Chemicals
- Pulsed Flow Adsorption Columns for Multi-Component Gas Separation
- Advanced Hot Gas Filter Development
- Advanced Ceramic Fibers for a Carbonate Fuel Cell Matrix
- Production of Carbon Materials for Lignin
- Composite Plasma-Polymer Membranes
- Fullerene-Based Catalysis for Heavy Oil Upgrading
- Economical Photochromic Fibers Based on Metal Oxides
- An Advanced Electrochemical Sensor for the Simultaneous Analytical Measurement of Three Chemical Species

Amount of funding available for chemical industry-related R&D:

In FY 94, approximately \$22 million was awarded for SBIR and STTR chemical industry-related Phase I and Phase II projects, and in FY 95, approximately \$28 million was awarded.

Length of involvement in chemical industry-related R&D efforts:

The SBIR program was mandated in 1982, and the STTR program was mandated in 1992.

Relationship to OIT programs (if applicable):

Annual solicitations are issued for both the SBIR and STTR programs, specifying the technical areas in which grant applications are requested. From time to time, one of these areas comes within the responsibility of the Office of Industrial Technologies; a staff member of OIT serves as Technical Topic Manager for that area, and is involved in the technical review and evaluation of those grant applications.

Notes:

Sources of information: Personal communication.

Date of last revision: August 1, 1995.

U.S. Department of Energy
Office of Energy Research
Office of Health and Environmental Research, ER-70
19901 Germantown Road
Germantown, MD 20874-1290

Contact: Dr. Ari Patrinos
Phone: 301-903-3251
Fax: 301-903-5051
E-mail: ARI.PATRINOS@OER.DOE.GOV

Description of agency involvement in chemical industry-related R&D:

Within the Office of Health and Environmental Research, the Biological and Environmental Research Program obtains scientific and technical knowledge in several directed research programs - that new knowledge should assist in the following: understanding and mitigating the long-term health and environmental consequences from energy production and the use of different technologies; achieving fundamental understanding of biological and environmental components and processes; developing advanced technologies that will improve medical care, public health, and worker safety; adding value to the U.S. economy by enabling others to safely implement new or improved technologies; enabling other offices of DOE to succeed in their missions; and fostering a safe and appropriate use of science and technology to problems of national need.

Research divisions include: Environmental Sciences, Health Effects and Life Sciences Research, and Medical Applications and Biophysical Research. The office sponsors approximately 850 projects at the national laboratories and in the private sector.

Health research topics include:

- Radiation and Chemical Effects
 - Biological Effects Studies
 - Cellular and Molecular Biology
 - Physical and Chemical Processes
 - Instrumentation Research
- Biotechnology
 - Human Genome
 - Structural Biology
 - Medical Applications

Environmental research topics include:

- Environmental Processes
 - Atmospheric Chemistry and Dynamics
 - Ocean Margins
 - Subsurface Science
 - Ecological Research
- Global Change
 - Climate Modeling and Computer Hardware, Advanced Mathematics, and Model Physics
 - The Atmospheric Radiation Measurement Program

- Carbon Cycle and Vegetation Research
- Oceans Research
- National Institute of Global Environmental Change

Amount of funding available for chemical industry-related R&D:

For the Office of Environmental Health and Research, in FY 92, approximately \$352 million was appropriated; in FY 93, approximately \$343 million was appropriated; in FY 94 approximately \$388 million was appropriated; and in FY 95, approximately \$426 was appropriated.

Length of involvement in chemical industry-related R&D efforts:

The Office of Environmental Health and Research traces its origins to the Atomic Energy Act of 1946, which provided the initial charter for a comprehensive program of applied and basic biological and environmental research.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
 *Research in Progress: FY 1992, Summaries of Projects Sponsored by the
 Office of Health and Environmental Research (DOE/ER/0592).*
 Internet resources.

Date of last revision: September 8, 1995.

Federal Agencies Active in Chemical Industry-Related R&D

U.S. Department of Energy
Office of Environmental Remediation and Waste Management
Office of Technology Development
2400 Century Boulevard
Germantown, Maryland 20874

Contact: Mr. Stephen Lien
Phone: 301-903-7911
Fax: 301-903-7457
E-mail: STEPHEN.LIEN@EM.DOE.GOV

Description of agency involvement in chemical industry-related R&D:

Within the Office of Environmental Remediation and Waste Management, the Office of Technology Development is responsible for managing an aggressive national program of applied research, development, demonstration, testing, and evaluation for environmental cleanup, waste management and related technologies. The technology development program is designed to resolve major technical issues, to rapidly advance beyond current technologies for environmental restoration and waste management operations, and to expedite compliance with applicable environmental laws and regulations. The underlying strategy is to identify and develop high-payoff environmental restoration and waste management technologies that can: clean up the 1989 inventory of DOE nuclear component manufacturing sites; and manage DOE-generated waste faster, better, safer and cheaper than is possible with current environmental cleanup technologies. In many cases, the development of new technology presents the best hope for ensuring a substantive reduction in risk to the environment and improved worker/public safety within realistic financial constraints.

The Office of Research and Development is responsible for the development of applied research and development programs at DOE sites nationwide. Programs are designed to identify operational needs in the areas of environmental restoration, waste operations, and corrective activities to rapidly advance beyond currently available technologies, and to provide solutions to key technical issues that, if not solved in a timely manner, will adversely affect DOE's ability to meet its 30-year cleanup goal.

Amount of funding available for chemical industry-related R&D:

In FY 92, approximately \$169 million was allocated for research, development, demonstration, testing and evaluation. In FY 93, approximately \$200 million was allocated.

Length of involvement in chemical industry-related R&D efforts:

The Environmental Remediation and Waste Management office was formed in 1989.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Internet resources.

Date of last revision: September 28, 1995.

U.S. Department of Energy
Office of Fossil Energy, FE-231
20300 Century Boulevard
Germantown, MD 20874

Contact: Mr. Edward Schmetz
Phone: 301-903-3931
Fax: 301-903-2406
E-mail: EDWARD.SCHMETZ@HQ.DOE.GOV

Description of agency involvement in chemical industry-related R&D:

The Office of Fossil Energy manages a national technology program to increase natural gas and petroleum supplies and provide cleaner, more efficient ways to use coal and natural gas to generate electricity. The office also oversees the Strategic Petroleum Reserve (the Nation's emergency oil stockpile) and the Naval Petroleum and Oil Shale Reserves. The office supports two technology centers which focus on fossil energy research: the Morgantown Energy Technology Center (METC) and the Pittsburgh Energy Technology Center (PETC).

The office has a program area known as clean fuels, where coal and natural gas can serve as the feedstocks for processes that produce clean liquid fuels and chemicals that can substitute for petroleum-based liquids. The office is conducting three major research programs to develop more affordable and efficient techniques to produce these future sources of clean, supplemental fuels:

- Coal Liquefaction Technology - Converting Coal into Liquid Fuel
- Gas-to-Liquid Technology - Converting Methane and Light Hydrocarbon Gases to Liquids
- Coal-Based Alternative Fuels

Amount of funding available for chemical industry-related R&D:

The clean fuels program area received approximately \$25 million in funding for FY 94 and \$27 million in FY 95.

Length of involvement in chemical industry-related R&D efforts:

The office has been involved in related efforts since the 1970's.

Relationship to OIT programs (if applicable):

Joint activities exist between Fossil Energy and OIT, particularly in the area of petroleum refining.

Notes:

Sources of information: Personal communication.
Internet resources.

Date of last revision: September 20, 1995.

Federal Agencies Active in Chemical Industry-Related R&D

The following entries are DOE laboratories and facilities. These laboratories and facilities are heavily involved in chemical industry-related efforts. However, most of this activity is based on other DOE involvement, and the focus of this edition was intended to be on "headquarters" activities. A future edition may contain more information about these laboratories and facilities.

Ames Laboratory
Ames, IA 50011

National Institute for Petroleum and Energy Research
Bartlesville, OK 74005

Argonne National Laboratory
Argonne, IL 60439

National Renewable Energy Laboratory
Golden, CO 80401

Brookhaven National Laboratory
Upton, NY 11973

Oak Ridge National Laboratory
Oak Ridge, TN 37831

Idaho National Engineering Laboratory
Idaho Falls, ID 83415

Pacific Northwest Laboratory
Richland, WA 99352

Kansas City Plant
Kansas City, MO 64141

Pittsburgh Energy Technology Center
Pittsburgh, PA 15236

Lawrence Berkeley Laboratory
Berkeley, CA 94720

Sandia National Laboratories - Albuquerque
Albuquerque, NM 87185

Lawrence Livermore National Laboratory
Livermore, CA 94550

Sandia National Laboratories - Livermore
Livermore, CA 94551

Los Alamos National Laboratory
Los Alamos, NM 87545

Savannah River Site
Aiken, SC 29801

Morgantown Energy Technology Center
Morgantown, WV 26507

Y-12
Oak Ridge, TN 37831

DEPARTMENT OF HEALTH AND HUMAN SERVICES

The Department of Health and Human Services is the Cabinet-level department of the Federal executive branch most concerned with people and most involved with the Nation's human concerns. In one way or another - whether it is mailing out social security checks or making health services more widely available - Health and Human Services touches the lives of more Americans than any other Federal agency. It is literally a department of people serving people, from newborn babies to our most elderly citizens.

U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry (ATSDR)
Division of Toxicology
1600 Clifton Rd. NE, Mail Stop E-29
Atlanta, GA 30333

Contact: Dr. William Cibulas
Phone: 404-639-6306
Fax: 404-639-6315
E-mail: WIC1@ATSOD3.CDC.GOV

Description of agency involvement in chemical industry-related R&D:

Congress requires the Agency for Toxic Substances and Disease Registry (ATSDR) to implement the health-related sections of laws that protect the public from hazardous wastes and environmental spills of hazardous substances. Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, ATSDR has, among others, responsibilities to: (1) conduct survey and screening programs to determine the relationships between exposure to toxic substances and illness; (2) conduct studies of people exposed to hazardous substances from a release or threatened release; and (3) initiate substance-specific research, in cooperation with the National Toxicology Program and Environmental Protection Agency, to determine the adverse health effects of exposure to hazardous substances. To meet its mandates, ATSDR works closely with state and federal agencies and the private sector. Toxicological research, including epidemiologic assessments of selected populations and toxicologic testing of individual chemicals or chemical mixtures, is currently conducted through contractual, interagency, and cooperative agreements. ATSDR is currently funding approximately 30 projects in these areas. Sample project titles and participants include:

- Prechronic Toxicity Studies on 1,1,1-trichloroethane (National Toxicology Program)
- Multi-generational Studies of the Toxic Effects of Mercury and Zinc in Rats and Mice (Tuskegee University School of Veterinary Medicine)
- A Controlled Evaluation of Neurobehavioral Performance in a Cohort of Chronically Pesticide Exposed Farm Residents (University of Washington)

Amount of funding available for chemical industry-related R&D:

For research related to chemical toxicology, in FY 94, approximately \$10 million was obligated, and in FY 95 approximately \$7 million was obligated.

Length of involvement in chemical industry-related R&D efforts:

ATSDR has provided extramural funds for related activities since approximately 1983.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.

Date of last revision: August 1, 1995.

U.S. Department of Health and Human Services
Public Health Service
Centers for Disease Control and Prevention
National Center for Environmental Health
1600 Clifton Rd. NE, 1103 CMB-17
Atlanta, GA 30333

Contact: Dr. Eric Sampson, Director Environmental Health Laboratory Sciences
Phone: 770-488-7950
Fax: 770-488-4839
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The mission of the National Center for Environmental Health is to promote health and quality of life by preventing and controlling disease, injury, and disability caused by or related to the interactions between people and their environment outside the workplace.

The environmental health laboratory sciences component of the center encompasses advanced laboratory science to help prevent environmental disease; development and application of laboratory measurements of exposure to toxicants and health effects from exposures (e.g., cancer); laboratory assessment of exposure and disease for health studies of populations exposed or potentially exposed to toxicants such as lead, cadmium, mercury, dioxin, PCBs, pesticides, environmental tobacco smoke, benzene, toluene, and others; laboratory support during national and international environmental health emergencies in order to determine the cause of death or disease; technical assistance, training, and technology transfer to states; central laboratory for the National Health and Nutrition Examination Survey; special prevention programs: infant screening for preventable diseases (e.g., sickle cell disease) and standardization of cholesterol measurements to diagnose and treat risk for coronary disease.

Branches include: clinical biochemistry, molecular biology, nutritional biochemistry, and toxicology.

Amount of funding available for chemical industry-related R&D:

In both FY 94 and FY 95, the amount of direct funding was approximately \$6 million annually.

Length of involvement in chemical industry-related R&D efforts:

The center (originally known as the Center for Environmental Health) was formed in 1980.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Internet resources.

Date of last revision: September 11, 1995.

U.S. Department of Health and Human Resources
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
1600 Clifton Rd. NE
Mail Stop D30
Atlanta, GA 30333

Contact: Dr. Roy Fleming
Phone: 404-639-3342
Fax: 404-639-2196
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The National Institute for Occupational Safety and Health (NIOSH) is a Federal agency that is part of the Centers for Disease Control and Prevention (CDC) and is responsible for conducting research and making recommendations for the prevention of work-related illness and injuries. The Institute's responsibilities include the following:

- Investigating potentially hazardous working conditions as requested by employers or employees
- Evaluating hazards in the workplace, ranging from chemicals to machinery
- Creating and disseminating methods for preventing disease, injury, and disability
- Conducting research and providing scientifically valid recommendations for protecting workers

Amount of funding available for chemical industry-related R&D: Unknown.

Length of involvement in chemical industry-related R&D efforts:

NIOSH was established in 1970 as part of the Occupational Safety and Health Act of 1970.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Internet resources.

Date of last revision: September 27, 1995.

U.S. Department of Health and Human Services
Public Health Service
Food and Drug Administration
Center for Drug Evaluation and Research
Office of Research Resources
Parklawn Building, 13B16
5600 Fishers Lane
Rockville, MD 20857

Contact: Mr. Joseph Contrera or Mr. Frederic Geissel
Phone: 301-443-4750
Fax: 301-443-4518
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The Center for Drug Evaluation and Research is the Food and Drug Administration (FDA) arm that regulates prescription and over-the-counter medicines for humans. The center's mission is to:

- approve drugs for marketing that are effective for their labeled indications, provide benefits that outweigh their risks, are of high quality, and have directions for use that are complete and honestly communicated;
- facilitate early access to promising experimental drugs being developed for serious illnesses with no adequate therapy;
- promote innovation and provide scientific leadership in the drug development process;
- ensure that the safety and rights of patients in drug studies are adequately protected; and
- ensure that the quality and safety of medicines are maintained after marketing.

The center's efforts are coordinated with the National Center for Toxicological Research (see separate entry).

Amount of funding available for chemical industry-related R&D: Unknown.

Length of involvement in chemical industry-related R&D efforts:

The Food and Drug Administration has been involved in related efforts since its inception in 1907.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Internet resources.

Date of last revision: September 20, 1995.

Federal Agencies Active in Chemical Industry-Related R&D

U.S. Department of Health and Human Services
Public Health Service, Food and Drug Administration
National Center for Toxicological Research
3900 NCTR Road
Jefferson, AR 72079-9502

Contact: Mr. Pete Attwood, Associate Director for Research Support
Phone: 501-543-7504
Fax: 501-543-7576
E-mail: VATTWOOD@FDANT.NCTR.FDA.GOV

Description of agency involvement in chemical industry-related R&D:

The National Center for Toxicological Research (NCTR) is a Food and Drug Administration (FDA) research facility whose mission is to conduct peer-reviewed scientific research that supports and anticipates FDA's current and future regulatory needs. This involves fundamental and applied research specifically designed to define biological mechanisms of action underlying the toxicity of products regulated by the FDA; aimed at understanding critical biological events in the expression of toxicity and at developing methods to improve assessment of human exposure, susceptibility and risk.

Programs include:

• Analytical Methods Development	• Transgenics
• Applied and Environmental Microbiology	• Solid-State Toxicity
• Biochemical and Molecular Markers of Cancer	• Neurotoxicology
• Developmental Toxicology	• Quantitative Risk Assessment
• Nutritional Modulation of Risk and Toxicity	

Sample project titles include:

- Degradation of Polycyclic Aromatic Hydrocarbon by Bacteria in Continuous Culture
- Multinuclear NMR Studies on the Structure and Conformation of Metabolites and Adducts of Polycyclic Aromatic Hydrocarbons
- Toxic Hazards from Anti-Thyroid Chemicals
- Mechanisms of Drug Toxicity

Amount of funding available for chemical industry-related R&D:

The center's total budget for FY 95 was approximately \$42 million.

Length of involvement in chemical industry-related R&D efforts:

The center was established in 1971.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
NCTR Research Accomplishments and Plans, FY 1994-95.

Date of last revision: September 12, 1995.

U.S. Department of Health and Human Services
Public Health Service, National Institutes of Health
National Institute of Environmental Health Sciences
National Toxicology Program
P.O. Box 12233
Research Triangle Park, NC 27709

Contact: Dr. Kenneth Olden, Director
Phone: 919-541-3201
Fax: 919-541-2260
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The National Toxicology Program (NTP), headquartered at the National Institute of Environmental Health Sciences (NIEHS) in Research Triangle Park, NC, was established as a cooperative effort within the Public Health Service to coordinate toxicology research and testing activities within the Department of Health and Human Services, to provide information about potentially toxic chemicals to health, regulatory, and research agencies and the public, and to strengthen the science base in toxicology.

The three NTP participating agencies are the NIEHS, the Food and Drug Administration's National Center for Toxicological Research, and the Centers for Disease Control's National Institute for Occupational Safety and Health. Program areas include the following:

- Carcinogenesis
- General Toxicology
- Immunotoxicology
- Neurotoxicology
- Respiratory Toxicology
- Reproductive and Developmental Toxicology
- Chemical Disposition
- Alternative Methods.

Amount of funding available for chemical industry-related R&D:

The National Toxicology Program receives funding from the participating agencies with the vast majority coming from NIEHS. In FY 94, total funding was approximately \$82 million.

Length of involvement in chemical industry-related R&D efforts:

The National Toxicology Program was established in 1978.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
National Toxicology Program Fiscal Year 1994 Annual Plan.
Internet resources.

Date of last revision: September 8, 1995.

U.S. Department of Health and Human Services
Public Health Service, National Institutes of Health
National Institute of Environmental Health Sciences
Superfund Basic Research Program
P.O. Box 12233
Research Triangle Park, NC 27709

Contact: Ms. Beth Anderson, Program Analyst
Phone: 919-541-4481
Fax: 919-541-2843
E-mail: TAINER@NIEHS.NIH.GOV

Description of agency involvement in chemical industry-related R&D:

The Superfund Basic Research Program (SBRP) is a university-based program focusing on basic research and training grants directed towards understanding, assessing, and attenuating the adverse effects on human health resulting from exposure to hazardous substances. Grants made under the SBRP are for coordinated, multicomponent, interdisciplinary programs; the objective is to establish and maintain a unique Program linking biomedical research with related engineering, hydrogeologic, and ecologic components. The program was enacted by the Superfund Amendments and Reauthorization Act (SARA) of 1986 to complement existing activities within the EPA and ATSDR.

The SBRP is intended to support a wide range of research to address the broad public health concerns arising from the release of hazardous substances and hazardous wastes into the environment; particularly from uncontrolled, leaking waste disposal sites. The ultimate goal of the program is to prevent adverse human health effects. Presently, the program funds 17 grants encompassing approximately 140 individual research projects, and include the following mandated areas:

- Methods and technologies to detect hazardous substances in the environment
- Advanced techniques for the detection, assessment, and evaluation of the effects on human health of hazardous substances
- Methods to assess the risks to human health presented by hazardous substances
- Basic biological, chemical, and physical methods to reduce the amount and toxicity of hazardous substances.

Amount of funding available for chemical industry-related R&D:

Authorized funding for the program in both FY 94 and FY 95 was around \$35 million for each year.

Length of involvement in chemical industry-related R&D efforts:

The program has existed since 1987.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Internet Resources.

Date of last revision: August 28, 1995.

U.S. Department of Health and Human Services
Public Health Service, National Institutes of Health
National Institute of General Medical Sciences
Natcher Bldg., Room 2AN-12
45 Center Drive MSC 6200
Bethesda, MD 20892-6200

Contact: Mr. Marvin Cassman, Acting Director
Phone: 301-594-2172
Fax: 301-402-0156
E-mail: CASSMANM@GM1.NIGMS.NIH.GOV

Description of agency involvement in chemical industry-related R&D:

The National Institute of General Medical Sciences (NIGMS) is one of the National Institutes of Health (NIH), the principal biomedical research agency of the federal government. NIGMS is unique among the components of NIH in that its main mission is the advancement of the basic biomedical sciences. NIGMS supports selected research and research training programs (not targeted to specific diseases or disorders) in areas that underlie all medical investigation, such as pharmacology and biorelated chemistry, and cellular and molecular biology. Knowledge resulting from this work contributes directly to the progress of research on specific diseases in the other components of NIH. NIGMS also develops and supports interdisciplinary studies in genetics, biophysics, physiology, and trauma and burn research.

Because scientific breakthroughs often originate from such untargeted studies, NIGMS-funded work has contributed substantially to the tremendous progress that biomedical research has made in recent years. The Institute's training programs help provide the most critical element of good research: well-prepared scientists. NIGMS has three divisions that support research and research training in basic biomedical science fields. The vast majority of this money goes to fund grants to scientists at universities, medical schools, hospitals, and research institutions throughout the country. At any given time, NIGMS supports over 3,300 research grants--about 14 percent of the grants funded by NIH as a whole. The key areas in which these divisions fund research are listed below their names:

Division of Cell Biology and Biophysics

• analytical and separation techniques	• bioengineering
• biomedical instrumentation	• cell organization, motility, and division
• lipid biochemistry	• membrane structure and function
• molecular biophysics	• spectroscopic techniques
• structural biology	

Division of Genetics and Developmental Biology

• cell growth and differentiation	• chromosome organization and mechanics
• control of gene expression	• developmental genetics and cell biology
• extrachromosomal inheritance	• human medical genetics
• mechanisms of mutagenesis	• molecular immunobiology
• neurogenetics and the genetics of behavior	• population genetics
• replication, recombination, and repair of genes	

Federal Agencies Active in Chemical Industry-Related R&D

Division of Pharmacology, Physiology, and Biological Chemistry

- anesthesiology
- bioenergetics
- biotechnology
- medicinal chemistry
- physiology
- trauma and burn injury
- biochemistry
- bio-organic and bio-inorganic chemistry
- glycoconjugates
- pharmacology
- synthetic chemistry

Amount of funding available for chemical industry-related R&D:

In FY 1995, the institute's budget was \$905 million. The breakdown for the three major divisions is as follows:

- Genetics and Developmental Biology \$277.2 million
- Pharmacology, Physiology, and Biological Chemistry \$260.3 million
- Cell Biology and Biophysics \$281.4 million.

Length of involvement in chemical industry-related R&D efforts:

NIGMS was established in 1962.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Internet Resources.

Division contacts:

Cell Biology and Biophysics:

Dr. James C. Cassatt, Director
301-496-7253
CZJ@CU.NIH.GOV

Genetics and Developmental Biology :

Dr. Judith H. Greenberg, Director
301-594-0943
GREENBEJ@GM1.NIGMS.NIH.GOV

Pharmacology, Physiology, and Biological Chemistry :

Dr. Michael E. Rogers, Acting Director
301-594-3827
ROGERSM@GM1.NIGMS.NIH.GOV

Date of last revision: August 29, 1995.

U.S. Department of Health and Human Services
Public Health Service
SBIR/STTR Solicitation Office
13687 Baltimore Avenue
Laurel, MD 20707-5096

Contact: SBIR/STTR Solicitation Office
Phone: (301) 206-9385
Fax: (301) 206-9722
Internet: a2y@cu.nih.gov

Description of agency involvement in chemical industry-related R&D:

The Public Health Service Small Business Innovation Research (SBIR) Program encourages proposals in fields of interest to the service. Phase I awards may not exceed \$100,000 for direct costs, indirect costs, and fixed fee for a period normally not to exceed six months. Phase II awards may not exceed \$750,000 for direct costs, indirect costs, and fixed fee for a period normally not to exceed two years. Around 700 Phase I awards are expected to be made based on the most recent solicitation.

Sample topic areas with relevance to the chemical industry include:

- Pharmaceutical Development for Alcoholism Treatment
- Effects of Drugs at the Cellular Level
- Toxicity Studies
- Pharmacology, Physiology, and Biological Chemistry Division (NIGMS)
- Engineering Control Systems

In FY 94, 746 awards were made, 596 for Phase I and 150 for Phase II. Sample awards include:

- Novel Biopolymers for the Medical Industry
- Dehydrogenase Crystals as Catalysts in Organic Synthesis
- Improved Ultrafilters for Bioprocessing
- Novel Fluorogenic Enzyme Substrates and Their Uses

Amount of funding available for chemical industry-related R&D:

In FY 94, funding for awards totaled over \$133 million.

Length of involvement in chemical industry-related R&D efforts:

The Public Health Service SBIR program has existed since the early 1980s.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Small Business Innovation Research Fiscal Year Phase I and Phase II Projects Abstract Book, FY 1994, Dept. of Health and Human Services.
Internet Resources.

Date of last revision: September 29, 1995.

DEPARTMENT OF THE INTERIOR

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; assessing and protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

Federal Agencies Active in Chemical Industry-Related R&D

U.S. Department of the Interior
Bureau of Mines
Center for Materials Partnerships
Albany Research Center
1450 Queen Avenue SW
Albany, OR 97321-0021

Contact: Mr. Bill Riley
Phone: 503-967-5851
Fax: 503-967-5936
E-mail: RILEY@ALRC.USBM.GOV

Description of agency involvement in chemical industry-related R&D:

The Center for Materials Partnerships, through partnerships with industry, government and academia, develops new technologies that conserve resources through extending service life and reduce environmental impact by substituting materials or new processes.

Primary areas of chemical industry-related R&D emphasize materials for harsh environments. The Center for Materials Partnerships is currently funding approximately eleven projects in these areas. Sample project titles include:

- Continuous Production of Titanium Powder
- Processing and Properties of Advanced Refractory Ceramics
- Wear-Corrosion Mechanisms in Mineral Processing

Amount of funding available for chemical industry-related R&D:

In FY 94, approximately \$4.8 million was authorized, and in FY 95, approximately \$4.4 million was authorized.

Length of involvement in chemical industry-related R&D efforts:

The Center for Materials Partnerships was formed in 1995. Prior to this date, the materials research was conducted within the Division of Minerals and Materials Science.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Other contact: Pragna Bhakta, 202-501-9284.

Date of last revision: August 2, 1995.

U.S. Department of the Interior
Bureau of Mines
Center for Pollution Prevention and Control
Salt Lake City Research Center
729 Arapahoe Drive
Salt Lake City, UT 84108-1283

Contact: Ms. Paulette Lym
Phone: 801-584-4152
Fax: 801-584-4134
E-mail: LYMPB@SLRC.USBM.GOV

Description of agency involvement in chemical industry-related R&D:

The Center for Pollution Prevention and Control develops and demonstrates cost-effective technologies to prevent environmental damage from mining and mineral-related activities, in partnership with other government agencies, producers and consumers.

Primary areas of chemical industry-related R&D emphasize environmentally compatible extraction systems, improved sensors and process control technology, bioprocessing, and toxic/hazardous waste disposal. The Center for Pollution Prevention and Control is currently funding approximately ten projects in these areas. Sample project titles and participants include:

- Rapid Analysis and Control of Process Streams (Kennecott Copper Company)
- Thiosulfate As an Alternative to Cyanide (Electric Power Research Institute)
- Double Membrane Electrolytic Cell Technology (BHP Minerals, HECLA)
- Fundamental and Applied Aspects of Mineral Bioprocesses (BHP Minerals, Copper Range Mining Company)

Amount of funding available for chemical industry-related R&D:

The Center for Pollution Prevention and Control was newly formed in FY 95. Approximately \$21 million was authorized.

Length of involvement in chemical industry-related R&D efforts:

Prior to the formation of the Center for Pollution Prevention and Control, this kind of work was conducted within the Division of Minerals and Materials Science.

Relationship to OIT programs (if applicable):

Joint project on appliance recycling and close cooperation in the recycling arena.

Notes:

Sources of information: Personal communication.
Other contact: Pragna Bhakta, 202-501-9284.

Date of last revision: August 2, 1995.

Federal Agencies Active in Chemical Industry-Related R&D

U.S. Department of the Interior
Bureau of Mines
Division of Environmental Technology
810 7th Street
Washington, DC 20241

Contact: Mr. William Schmidt
Phone: 202-501-9269
Fax: 202-501-9957
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The Division of Environmental Technology, through partnerships with industry, government and academia, develops innovative technologies to remediate environmental contamination from the mining and mineral processing industries. The Division is currently funding two chemical industry-related research projects in this area:

- Treatment of Phosphate Wastes
- Vittrification of Municipal Wastes

Amount of funding available for chemical industry-related R&D:

In FY 94, approximately \$440,000 was authorized for these research efforts, and in FY 95 approximately \$440,000 was authorized.

Length of involvement in chemical industry-related R&D efforts:

The Division of Environmental Technology was formed in 1987 to develop innovative technologies to prevent and remediate environmental contamination associated with mining and mineral processing.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.

Date of last revision: August 1, 1995.

DEPARTMENT OF TRANSPORTATION

The U.S. Department of Transportation establishes the Nation's overall transportation policy. Under its umbrella there are nine administrations whose jurisdictions include highway planning, development, and construction; urban mass transit; railroads; aviation; and the safety of waterways, ports, highways, and oil and gas pipelines. Decisions made by the Department in conjunction with the appropriate state and local officials strongly affect other programs such as land planning, energy conservation, scarce resource utilization, and technological change.

Federal Agencies Active in Chemical Industry-Related R&D

U.S. Department of Transportation
Federal Highway Administration, Office of Research and Development
Office of Engineering and Highway Operations Research and Development
6300 Old Georgetown Pike
McLean, VA 22101

Contact: Mr. Brian Chollar
Phone: 703-285-2342
Fax: 703-285-2950
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The Federal Highway Administration administers highway transportation programs of the Department of Transportation. Research and technology programs focus on: intelligent vehicle/highway systems, highway R&D, long-term pavement performance, technology applications, rural technical assistance, and the National Highway Institute. The administration focuses its programs on highway safety, structures, pavements, materials, environment, policy, and planning to discover ways to improve the quality and durability of highway and streets, to reduce construction and maintenance costs, address emerging highway policy issues, respond to planning and environmental requirements of the Intermodal Surface Transportation Efficiency Act, and analyze impacts of highway transportation.

Within the Turner-Fairbank Highway Research Center exists the Office of Research and Development with around 20 separate laboratories. Research areas relevant to the chemical industry include:

- Asphalt research including asphalt modification and solventless recovery systems for recycling
- Corrosion research including solventless paints and coatings for bridges and re-bars
- Snow and ice control chemical research including calcium magnesium acetate and potassium acetate production (through low-cost acetic acid production methods) and anti-icing technology.

Amount of funding available for chemical industry-related R&D:

In the past several years combined, around \$11 million has been spent for anti-icing technology, snow and ice control, and calcium magnesium acetate research; \$7 million for corrosion research; and \$6 million for asphalt modification research.

Length of involvement in chemical industry-related R&D efforts:

Most of these efforts have occurred in the past 10 years. The Federal Highway Administration has been studying asphalt properties for nearly 50 years.

Relationship to OIT programs (if applicable):

No formal relationship, however, the OIT projects *Development of Asphalts and Pavements Using Recycled Tire Rubber*, *Development of Superior Asphalt Recycling Agents*, and *Biological Conversion of Waste Gases into Acetic Acid* are of interest to the administration.

Notes:

Sources of information: Personal communication.

Date of last revision: September 25, 1995.

ENVIRONMENTAL PROTECTION AGENCY

The Environmental Protection Agency protects and enhances our environment today and for future generations to the fullest extent possible under the laws enacted by Congress. The Agency's mission is to control and abate pollution in the areas of air, water, solid waste, pesticides, radiation, and toxic substances. Its mandate is to mount an integrated, coordinated attack on environmental pollution in cooperation with state and local governments.

Federal Agencies Active in Chemical Industry-Related R&D

U.S. Environmental Protection Agency
Innovative Technology Council
Environmental Technology Initiative
401 M St. SW
Washington, DC 20460

Contact: Mr. Fred Lindsey
Phone: 202-260-2600
Fax: 202-260-3861
E-mail: LINDSEY.ALFRED@EPAMAIL.EPA.GOV

Description of agency involvement in chemical industry-related R&D:

The Environmental Technology Initiative (ETI) was outlined by President Clinton in February 1993 as a means of accelerating environmental protection, strengthening America's industrial base, and increasing exports of U.S. technologies and expertise. The initiative intends to serve a catalytic role in promoting the development of new technologies across a range of industrial sectors, including semiconductors, transportation, environmental management, information technology, cleaner industrial technologies that prevent pollution, defense conversion, and others.

In FY 94, the initiative funded 78 projects. The primary FY 95 solicitation, which sought proposals from federal agencies, states, and Indian tribes, included emphasis on certain industries and processes, which include:

Industrial Sectors: Special emphasis will be placed on industries dominated by small business as well as those being studied in the Agency's Common Sense Initiative, the Design for Environment Program and others. Potential industries include:

• metals	• electronics
• dry cleaning	• printing

Unit Operations: Industrial manufacturing operations have several processes that are common to various facilities regardless of their purpose. The pollution prevention technologies topic area seeks innovative technology proposals for:

• cleaning and degreasing	• coatings and solvents
• refrigerants used for cooling	

Functional Areas: Operational methods through which pollution prevention can be achieved will also be considered. These methods include research on process chemistry and/or changes that reduce the production and use of hazardous chemicals. Candidate areas include:

• green chemistry	• process controls and feedback systems
• green buildings	

Amount of funding available for chemical industry-related R&D:

The Congress appropriated \$36 million for ETI in FY 94 and appropriated \$68 million in FY 95. The primary FY 95 solicitation provided \$40 million in funding. The ETI also funds other smaller solicitations and climate change projects.

Length of involvement in chemical industry-related R&D efforts:

The Environmental Technology Initiative was initiated in FY 94.

Relationship to OIT programs (if applicable):

OIT solicited proposals for projects for the Environmental Technology Initiative.

Notes:

Sources of information: Personal communication.
 Pollution Prevention Directory, EPA.
 Internet resources.

Date of last revision: September 11, 1995.

Federal Agencies Active in Chemical Industry-Related R&D

U.S. Environmental Protection Agency
Office of Prevention, Pesticides, and Toxic Substances
Design for the Environment Program
401 M St. SW (TS-779)
Washington, DC 20460

Contact: Mr. Paul Anastas
Phone: 202-260-2659
Fax: 202-260-0981
E-mail: ANASTAS.PAUL@EPAMAIL.EPA.GOV

Dr. Joseph Breen
202-260-1678
Unknown
Unknown

Description of agency involvement in chemical industry-related R&D:

The Design for the Environment (DfE) Program has been created to apply EPA's expertise and leadership to inform and facilitate pollution prevention efforts. It harnesses the expertise for which the Office of Pollution Prevention and Toxics is best known: comparative and multi-media risk analysis, methods for evaluating alternatives for risk reduction, knowledge of regulatory requirements, and outreach to industry and the public on pollution prevention topics. The DfE Program focuses on areas it is most familiar with: pollution prevention efforts and environmental risk areas. Thus, the DfE Program promotes the incorporation of environmental considerations, and especially risk reduction, in the design and redesign of products and services. The Program works on a voluntary basis through partnerships with industry and the public formed to apply EPA expertise to specific issues.

One project within the program, Chemical Design, aims to change the way organic chemists approach the design of synthetic pathways for chemical production. EPA is encouraging consideration of alternative synthetic pathways through: (1) grant awards to academic institutions; (2) discussion at national symposia; and (3) use of computer programs which assist in the design of chemical pathways. In 1992, EPA awarded six grants to fund basic research projects which consider environmental impacts, and not just yield, in the design of chemical synthetic pathways. EPA has joined forces with the National Science Foundation (NSF) through a memorandum of understanding to award additional grants. By fostering this kind of basic research in organic chemistry, EPA and NSF hope to bring about a paradigm shift in the way chemists, in both academia and the chemical industry, think about the design and manufacture of chemicals. Grant titles include:

- Alternative for Toxic Solvents
- Replacing Benzene with Simple Sugars
- New Synthesis of Styrene

Amount of funding available for chemical industry-related R&D: Unknown.

Length of involvement in chemical industry-related R&D efforts: Unknown.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Internet resources.

Date of last revision: September 28, 1995.

U.S. Environmental Protection Agency
Office of Prevention, Pesticides and Toxic Substances
Office of Pollution Prevention
401 M St. SW
Washington, DC 20460

Contact: Ms. Lena Hann
Phone: 202-260-2237
Fax: Unknown
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The Office of Pollution Prevention coordinates EPA policy development in pollution prevention in all sectors. The office's charge is to help integrate a multimedia pollution prevention ethic both inside and outside EPA. While this office is the focal point of EPA's overall pollution prevention program, its primary role is to support pollution prevention efforts by the EPA's program offices, EPA regional offices, state and local governments, industry, and the public. To help accomplish its goals, pollution prevention coordinators have been established in both EPA's program offices and regions. The office funds a number of pollution prevention activities with relevance to the chemical industry, including:

National Industrial Competitiveness through Energy, Environment, and Economics (NICE)³

Program: A grant program designed to improve industrial energy efficiency, reduce costs, and lower emissions to the environment through the demonstration of innovative technologies.

Pollution Prevention Incentives for States: A grant program intended to build and support state pollution prevention capabilities and to test, at the state level, innovative pollution prevention approaches and methodologies through demonstration projects.

Agriculture in Concert with the Environment: A joint grant program between EPA and the Department of Agriculture which promotes the adoption of sustainable agriculture practices and reduces the use of highly toxic herbicides and other pesticides.

Amount of funding available for chemical industry-related R&D: Unknown.

Length of involvement in chemical industry-related R&D efforts: Unknown.

Relationship to OIT programs (if applicable):

The NICE³ Program is co-funded and managed by OIT.

Notes:

Sources of information: Personal communication.
Pollution Prevention Directory, EPA.

Contact for *Agriculture in Concert with the Environment:* Mr. Harry Wells, 703-308-8139.

Date of last revision: September 28, 1995.

U.S. Environmental Protection Agency
Office of Research and Development
National Center for Extramural Research and Quality Assurance
401 M St. SW (8701)
Washington, DC 20460

Contact: Dr. Melinda McClanahan, Associate Director for Science
Phone: 202-260-5750
Fax: 202-260-0450
E-mail: MCCLANAHAN.MELINDA@EPAMAIL.EPA.GOV

Description of agency involvement in chemical industry-related R&D:

The National Center for Extramural Research and Quality Assurance located in the Washington, D.C. area, is responsible for developing and managing an investigator-initiated research grants program. In addition, the center is also responsible for:

- Fellowships for undergraduate, graduate, and post-doctoral studies in scientific and engineering disciplines relevant to environmental stewardship;
- Mandatory quality assurance policy and oversight for all EPA programs involving environmental measurements;
- Agency-wide coordination of activities related to development, validation, and use of environmental monitoring methods;
- Peer reviews for the center's activities and for selected projects within other Office of Research and Development programs, EPA National and Regional Program Offices; and
- Visiting scientists and senior environmental employee programs.

The investigator-initiated research grants program supports basic research on environmental issues. Applications for FY 94 research grants were based on a general solicitation for applications which focused on broad environmental fields such as biology, chemistry, physics, engineering, and socioeconomics. Approximately 75 grants were awarded in FY 94. Sample project titles include:

- Influence of Organic Films on Reactivity and Hygroscopicity of Sulfuric Acid Aerosol
- Solventless Extraction of Organic Pollutants from Water with Solid-Base Microextraction
- Development of an Economic Treatment System to Detoxify Organic Chemicals
- Configuration and Sorption Properties of Two Synthetic Humic Substance Analogs: Polymaleic Acid and Pyrene-Labeled Polyacrylic Acid
- Degradation of Alkyl Halides by Nitrifying Bacteria Associated with Soil

Amount of funding available for chemical industry-related R&D:

The funding level for the research grants program was approximately \$21 million in FY 94 and \$44 million in FY 95.

Length of involvement in chemical industry-related R&D efforts:

The investigator-initiated research grants program has existed since 1980.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
 Annual Report of the Research Grants Program 1994, Office of
 Exploratory Research (EPA 600-R-94-158).
 Internet resources.

Date of last revision: September 14, 1995.

Federal Agencies Active in Chemical Industry-Related R&D

U.S. Environmental Protection Agency
Office of Research and Development
National Risk Management Research Laboratory
Air Pollution Prevention and Control Division
Mail Drop 60
Research Triangle Park, NC 27711

Contact: Mr. Charlie Sedman
Phone: 919-541-7700
Fax: Unknown
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The Air Pollution Prevention and Control Division of the National Risk Management Research Laboratory is EPA's major research organization for research, development, and evaluation of air pollution control technologies. The Division is located in Research Triangle Park, NC. The division has 8 branches and a staff of 102 researchers, technicians, and support staff. The Lab's branches are:

- Emissions and Modeling Branch
- Global Warming Control Branch
- Organics Control Branch
- Stratospheric Ozone Control Branch
- Combustion Research Branch
- Gas Cleaning Technology Branch
- Indoor Air Branch
- Radon Mitigation Branch

Amount of funding available for chemical industry-related R&D: Unknown.

Length of involvement in chemical industry-related R&D efforts: Unknown.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Internet resources.

Date of last revision: September 28, 1995.

U.S. Environmental Protection Agency
Office of Research and Development
National Risk Management Research Laboratory
Pollution Prevention Research Branch
26 West Martin Luther King Drive
Cincinnati, OH 45268

Contact: Mr. Harry Freeman, Chief
Phone: 513-569-7215
Fax: 513-569-7111
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The Pollution Prevention Research Branch at the National Risk Management Research Laboratory (formerly the Risk Reduction Engineering Laboratory) is responsible for supporting projects that develop and demonstrate clean production technologies, clean products, and innovative approaches to reducing the generation of pollutants in all media. The branch also supports pollution prevention assessments, lifecycle assessment and measurement methodologies, and promotes pollution prevention within the federal government. Many of the branch's efforts within each of five elements are carried out cooperatively with other government agencies, universities, and other environmental research organizations.

Elements under Cleaner Production Technologies include:

- Waste Reduction Innovative Technology Evaluation
- Support for RCRA Hard to Treat Wastes
- Support for the 33/50 Program
- Support for the Source Reduction Review Program
- Clean Technology Design and Development Projects.

Elements under Cleaner Products Research include:

- Evaluating the Potential for Safe Substitutes
- Clean Products/Source Reduction Case Studies
- Product and Process Design for Life-Cycle Risk Reduction
- Environmental Impact Mitigation.

Elements under Tools to Support Pollution Prevention include:

- Life Cycle Assessment Development and Demonstrations
- Measurement Methodology Tools Development.

Elements under Cooperative Pollution Prevention Projects with Other Federal Agencies include:

- Waste Reduction Evaluations at Federal Sites Program
- Strategic Environmental Research and Development Program
- Integrated Design Research Program.

Federal Agencies Active in Chemical Industry-Related R&D

Elements under Pollution Prevention Assessments and Support include:

- Small Generator Waste Minimization Assessments
- Industrial Assessment Centers Program
- Pollution Prevention for Public Agencies
- NATO/CCMS Project: Pollution Prevention Strategies for Sustainable Development
- Clean Technologies Guide.

Sample project titles include:

- Methyl Ethyl Ketone Substitute in Aircraft Radome Depainting
- Life Cycle Assessment Demonstration: Carpeting
- Coating Technology for Wood, Plastics and Composites
- Sodium Chloride Substitute for Deicing
- Supercritical CO₂ Fluid for Precision Parts Cleaning.

Amount of funding available for chemical industry-related R&D:

The FY 94 budget for the branch was approximately \$3.5 million.

Length of involvement in chemical industry-related R&D efforts:

The Pollution Prevention Research Branch was started in 1988.

Relationship to OIT programs (if applicable):

The OIT Energy Analysis and Diagnostic Centers program is being merged with the EPA Waste Minimization Assessment Centers program to form the Industrial Assessment Centers program.

The branch is also working with the OIT Alternative Feedstocks program in life cycle assessment research.

Notes:

Sources of information: Personal communication.

Pollution Prevention Research Branch Current Projects, November 1994.

Date of last revision: August 28, 1995.

U.S. Environmental Protection Agency
Office of Research and Development
Small Business Innovation Research Program (8301)
401 M St. SW
Washington, DC 20460

Contact: Mr. Don Carey
Phone: 202-260-7899
Fax: 202-260-4524
E-mail: CAREY.DON@EPAMAIL.EPA.GOV

Description of agency involvement in chemical industry-related R&D:

The EPA Small Business Innovation Research (SBIR) Program encourages proposals in advanced application areas in the fields of environmental engineering and environmental monitoring instrumentation, where it is directly connected to pollution control processes. Objectives of the program, in addition to supporting high-quality research, include stimulating technological innovation, increasing the commercial applications of EPA supported research, and improving the return on investment from federally funded research for its economic and social benefits to the nation.

Phase I awards currently provide up to \$65,000 for six months to determine the small firm's concept feasibility and their capability to perform high-quality research. Phase II awards, which currently provide up to \$220,000 for a period of one or two years, is the principal research effort for those projects that appear most promising after Phase I. Phase III is the product or process development phase to pursue commercial application, but no SBIR funds are provided in Phase III. In FY 1992, 41 Phase I awards were made which resulted in 21 Phase II awards in FY 1993. Also in FY 1993, 34 new Phase I awards were made. Sample project titles include:

- A Low Life-Cycle Cost UV Source and Reactor to Oxidize Aqueous Phase Organics
- Photo-Thermal Conversion of CFCs and Halons to Valuable and Environmental Safe Materials
- Conversion of Waste Stream Plastics Into Polymer Matrix Composite Materials
- Waste Reduction Through Benzene-Free Polymerization Technology
- Novel Catalysts for the Low Temperature Oxidation of Volatile Organic Compounds.

Amount of funding available for chemical industry-related R&D:

In FY 94, approximately \$4.85 million of awards were made, and in FY 95, approximately \$8.68 million in awards were made.

Length of involvement in chemical industry-related R&D efforts:

EPA's SBIR program has existed since 1983.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Abstracts of Phase I and Phase II Awards (EPA 600-R-93-241).
Personal communication.

Date of last revision: September 13, 1995.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

The National Aeronautics and Space Administration conducts research for the solution of problems of flight within and outside the Earth's atmosphere and develops, constructs, tests, and operates aeronautical and space vehicles. It conducts activities required for the exploration of space with manned and unmanned vehicles and arranges for the most effective utilization of the scientific and engineering resources of the United States with other nations engaged in aeronautical and space activities for peaceful purposes.

National Aeronautics and Space Administration
Office of Life and Microgravity Sciences and Applications
Microgravity Science and Applications Division
Mail Code UG
NASA Headquarters
Washington, DC 20546

Contact: Mr. Robert C. Rhome, P.E.; Director
Phone: 202-358-1490
Fax: 202-358-3091
E-mail: RRRHOME@HQ.NASA.GOV

Description of agency involvement in chemical industry-related R&D:

The mission of the Microgravity Science and Applications Division is to use the microgravity environment of space as a tool to advance knowledge; to use space as a laboratory to explore the nature of physical phenomena, contributing to progress in science and technology on Earth; and to study the role of gravity in technological processes, building a scientific foundation for understanding the consequences of gravitational environments beyond Earth's boundaries. The Microgravity Science and Applications Division conducts a program of basic and applied research in the areas of biotechnology, combustion, fluid physics, materials science, and selected areas of condensed matter and gravitational physics. Approximately 250 projects are currently being funded by this program. Sample project titles include:

- Protein Crystal Growth in Microgravity (biotechnology)
- Ignition and Flame Spread of Liquid Fuel Pools (combustion)
- Study of Two-Phase Flow and Heat Transfer in Reduced Gravities (fluid physics)
- Microgravity Chemical Vapor Deposition (material science)

Amount of funding available for chemical industry-related R&D:

The program budget in FY 1994 was \$188 million and in FY 1995 is \$170.1 million.

Length of involvement in chemical industry-related R&D efforts:

The program has existed since the late 1960's, when it was known as Materials Processing in Space. The Microgravity Science and Applications Division was formed in 1984.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Microgravity Science and Applications: Program Tasks and Bibliography for FY 1993, NASA Technical Memorandum 4569, March 1994.

Date of last revision: July 13, 1995.

National Aeronautics and Space Administration
Office of Space Access and Technology
Space Processing Division
Mail Code XP
NASA Headquarters
Washington, DC 20546

Contact: Mr. Ed Gabris
Phone: 202-358-4577
Fax: 202-358-2886
E-mail: EGABRIS@HQ.NASA.GOV

Description of agency involvement in chemical industry-related R&D:

The Office of Space Access and Technology is responsible for advanced technology development, technology transfer and commercial development of space. Managed by this office are 11 Centers for the Commercial Development of Space which are a nonprofit consortia of industry, academia and government designed to advance promising areas of space R&D with commercial applications. The centers serve as incubators for space-related products and services and offer U.S. organizations excellent opportunities to perform low-cost, space-based commercial R&D.

The program has focused areas of research, two such areas are biotechnology and materials processing. Sample projects from the biotechnology area are: bioprocessing/bioproduction development, physiological modeling in space, controlled agriculture systems development, and determining the 3-dimensional structure of protein crystals. Sample projects from the materials processing area are: space materials that can be used to build structures in space, liquid metal sintering, electrodeposition technique, using the ultra-vacuum of space for processing ultra-pure, thin film materials for electronics and computers.

Amount of funding available for chemical industry-related R&D:

In addition to an annual NASA-base grant funding of up to \$1 million, the centers receive financial and in-kind contributions from industry, universities, research institutions and federal, state and local organizations.

Length of involvement in chemical industry-related R&D efforts:

The program was established in 1985.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.

Date of last revision: September 29, 1995.

NATIONAL SCIENCE FOUNDATION

The National Science Foundation promotes the progress of science and engineering through the support of research and education programs. Its major emphasis is on high-quality, merit-selected research - the search for improved understanding of the fundamental laws of nature upon which our future well-being as a nation depends. Its educational programs are aimed at ensuring increased understanding of science and engineering at all educational levels, maintaining an adequate supply of scientists and engineers to meet our country's needs.

National Science Foundation
Bioengineering and Environmental Systems Division
4201 Wilson Blvd., 565
Arlington, VA 22230

Contact: Ms. Janie Fouke, Director
Phone: 703-306-1320
Fax: 703-306-0312
E-mail: JFOUKE@NSF.GOV

Description of agency involvement in chemical industry-related R&D:

The Bioengineering and Environmental Systems Division is concerned with expanding the knowledge base of bioengineering; extending engineering methodologies to the solution of problems in the biological and medical sciences; employing biological principles for the development of innovative engineering methods and systems; improving our ability to apply engineering principles to correct problems that impair the usefulness of land, air, and water; and exploring basic engineering concepts in the development, conservation, and use of ocean resources and systems. Research activities in this division relevant to the chemical industry include biochemical engineering, biotechnology and environmental systems.

Biochemical engineering supports the research and development of traditional fermentation and recombinant DNA processes for manufacturing substances of biological origin. Projects are supported that utilize biological microorganisms for the transformation of organic, raw materials (biomass) into useful products, and for the process engineering of foods. Downstream processing is becoming increasingly important as new advances in separation and purification technologies accelerate. Process integration, optimization, and design utilizing advanced monitoring and control methods are also very important.

Biotechnology links the expertise of engineering with the life sciences in order to provide a fundamental basis for the economical manufacturing of substances of biological origin. Engineers working together with life scientists on group projects are supported by this part of the program. Synergy among the various disciplines in these types of projects is a very important evaluation criterion. Topic areas include, but are not limited to, cell culture systems; bioreactor design; separation and purification processes; monitoring and control methods; and process integration, optimization, and design.

Environmental Systems supports research, the objective of which is to discover and learn how to apply engineering principles to reduce adverse effects of solid, liquid, and gaseous discharges to land, water, and air that impair their resource values. The program also supports research on innovative biological, chemical, and physical processes used alone or as components of engineered systems to restore the usefulness of polluted land, water, and air resources.

Amount of funding available for chemical industry-related R&D:

For FY 94 and FY 95, approximate funding in the environmental systems area was \$4.5 million each year, and approximate funding in the biochemical engineering and biotechnology areas was around \$7 million each year.

Length of involvement in chemical industry-related R&D efforts:

The Bioengineering and Environmental Systems Division was formed about 3 years ago. Similar research efforts existed under a predecessor organization.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Internet resources.

Other contacts:

Biotechnology and biochemical engineering: Mr. William Weigand
703-306-1319
WWEIGAND@NSF.GOV

Environmental systems: Mr. Edward Bryan
703-306-1318
EBRYAN@NSF.GOV

Date of last revision: September 26, 1995.

Federal Agencies Active in Chemical Industry-Related R&D

National Science Foundation
Chemical and Transport Systems Division
4201 Wilson Blvd., Room 525
Arlington, VA 22230

Contact: Dr. Kenneth R. Hall
Phone: 703-306-1371
Fax: 703-306-0319
E-mail: KHALL@NSF.GOV

Description of agency involvement in chemical industry-related R&D:

The Chemical and Transport Systems Division of the National Science Foundation (NSF) funds fundamental research into the nature of chemical systems. The general areas include: catalysis, reaction engineering, transport phenomena, interfacial phenomena, thermal processes, thermodynamics, separations, design theory, control of chemical systems, electrochemical phenomena, biochemical applications, and upstream environmental considerations.

At any given time the division has about 300 active projects. The usual size of a project is about \$75,000 per year. The division makes an effort to fund new investigators as well as established investigators. Nearly all investigators are faculty members in U.S. universities.

Amount of funding available for chemical industry-related R&D:

The yearly division budget is approximately \$40 million.

Length of involvement in chemical industry-related R&D efforts:

The division has existed at NSF under various titles since the early 1960s.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.

Date of last revision: August 7, 1995.

National Science Foundation
Chemistry Division
4201 Wilson Blvd., 1055
Arlington, VA 22230

Contact: Ms. Janet Osteryoung
Phone: 703-306-1845
Fax: 703-306-0534
E-mail: JOSTERYO@NSF.GOV

Description of agency involvement in chemical industry-related R&D:

Programs of the Chemistry Division support research activities and research infrastructure development in most of the principal subdisciplines of the chemical sciences. Chemistry Division programs also support research activities in emerging areas of national interest that cut across "traditional" subdisciplines. These areas include biological chemistry, materials chemistry, computational chemistry, environmental chemistry, and chemical complexity. Many of these activities are part of the government-wide research programs coordinated under the Federal Coordinating Council for Science, Engineering, and Technology.

Division programs and initiatives include: Analytical and Surface Chemistry; Inorganic, Bioinorganic, and Organometallic Chemistry; Organic Chemical Dynamics; Organic Synthesis; Experimental Physical Chemistry; Theoretical and Computational Chemistry; Special Projects Office; and Chemical Instrumentation and Facilities.

In both FY 94 and FY 95, the division supported almost 1,000 individual project research grants. The average grant continues for 36 months at about \$110 thousand per year.

Amount of funding available for chemical industry-related R&D:

In FY 94, the division's funding was approximately \$120 million, and in FY 95, the division's funding was approximately \$121 million.

Length of involvement in chemical industry-related R&D efforts:

Related efforts began in the early 1950s, around the same time the National Science Foundation was founded.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Internet resources.

Date of last revision: September 26, 1995.

Federal Agencies Active in Chemical Industry-Related R&D

National Science Foundation
Design, Manufacture, and Industrial Innovation Division
4201 Wilson Blvd., 550
Arlington, VA 22230

Contact: Mr. Bruce Kramer, Director
Phone: 703-306-1330
Fax: 703-306-0298
E-mail: BKRAMER@NSF.GOV

Description of agency involvement in chemical industry-related R&D:

The goal of this division is to support research that seeks to serve a broad spectrum of American industry through developing and expanding the scientific and engineering foundations of design, manufacturing, production, integration engineering, and management of technological innovation. Long-term efforts are needed to deepen our understanding of the processes, operations, and systems that comprise modern manufacturing, and to make our manufacturing base more competitive by increasing its innovation and responsiveness to changing needs. Support of the development of operations research methodologies that underlie the full range of engineering systems for production complements these efforts.

The National Science Foundation (NSF) has always been acutely aware of the relationships between industrial development, technological innovation, and scientific research. The division provides a focus for small business activities of the National Science Foundation and administers the NSF Small Business Innovation Research (SBIR) Program. Sample topics of recent SBIR research include:

- High speed gas chromatography
- Novel modified fluoropolymeric materials
- New production technology for ethylene glycol
- Innovative processing for production of fullerenes

Amount of funding available for chemical industry-related R&D:

Estimated funding for chemical industry-related R&D was \$3.2 million for FY 94 and FY 95.

Length of involvement in chemical industry-related R&D efforts:

The SBIR program has existed since the late 1970's at NSF.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Internet resources.

Date of last revision: August 14, 1995.

National Science Foundation
Materials Research Division
4201 Wilson Blvd., 1065
Arlington, VA 22230

Contact: Mr. David Nelson
Phone: 703-306-1838
Fax: 703-306-0515
E-mail: DNELSON@NSF.GOV

Description of agency involvement in chemical industry-related R&D:

The Division of Materials Research supports a wide range of programs that address fundamental phenomena in materials, materials synthesis and processing, materials structure and composition, materials properties and performance, and materials education. Formal research program areas include Condensed Matter Physics; Solid-State Chemistry and Polymers; Metals, Ceramics, and Electronic Materials; Materials Theory; and Materials Research Science and Engineering Centers. Investments in research infrastructure in materials science are also made through the National Facilities and Instrumentation Program.

As an example, the Solid-State Chemistry and Polymers Program is largely experimental and multidisciplinary with strong components of chemistry, physics, and materials science. The program emphasizes synthesis, processing, characterization, and structure property relationships of materials at the molecular level, with special attention to new materials or materials with superior properties. The solid-state chemistry program component supports research in the following areas: innovative synthetic routes to new inorganic and organic solid-state and mesophase materials; characterization of new materials with novel electronic, optical, magnetic, and chemical behavior; relationships among bulk, surface, interface, and defect structures, and properties such as chemisorption, transport, and reactivity; and materials preparation, processing, and optimization by chemical means. The creation of new materials exhibiting new phenomena is emphasized within selected classes of advanced materials such as biomolecular, magnetic, and superconducting materials, and with emphasis on special issues such as environmental concerns related to the processing and utilization of potentially functional materials.

Amount of funding available for chemical industry-related R&D:

Approximate division funding in FY 94 was \$167.2 million, and approximate division funding in FY 95 was \$175.4 million.

Length of involvement in chemical industry-related R&D efforts:

The division has been involved in related efforts since 1972.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
Internet resources.

Date of last revision: September 7, 1995.

National Science Foundation
Molecular and Cellular Biosciences Division
Biochemistry and Molecular Structure and Function Program
4201 Wilson Blvd.
Arlington, VA 22230

Contact: Dr. Marcia Steinberg
Phone: 703-306-1443
Fax: 703-306-0355
E-mail: MSTEINBE@NSF.GOV

Description of agency involvement in chemical industry-related R&D:

The Biochemistry and Molecular Structure and Function Program supports basic research aimed at: (1) understanding the structure and function of biological macromolecules; and (2) the characterization and regulation of biochemical pathways and other cellular processes. At any given time, the program supports about 400 projects through grants. The program encompasses a wide range of research topics and techniques and is divided into the three sub-programs described below.

The Metabolic Biochemistry Sub-Program supports research on the characterization and regulation of biochemical pathways and other processes by which microbes, and plant and animal cells transport, assimilate and derive energy from substrates. Exploration of primary and secondary metabolism at the levels of gene expression and enzyme function and regulation are major topics considered. Research on biogeochemical cycles and degradation of polymers and xenobiotics is also supported.

The Molecular Biochemistry Sub-Program supports research aimed at understanding the structure and function of biological macromolecules, and the molecular basis of their interactions. Areas of interest include proteins, nucleic acids, polysaccharides, and lipid aggregates. Studies are supported which consider: the molecular basis of the mechanism and regulation of enzyme catalysis; bioenergetics and photosynthesis; protein synthesis and ribosome structure; protein and nucleic acid synthesis; supramolecular complexes; and the synthesis and properties of biomolecular materials.

The Molecular Biophysics Sub-Program supports research on the structure, dynamics and interactions of biological macromolecules (proteins, nucleic acids, lipid assemblies, polysaccharides, etc.), utilizing advanced physical techniques. Areas of interest include: the three dimensional structure of macromolecules; the relationship between structure and function; assembly and architecture of supramolecular structures (e.g., multienzyme units, viruses, membranes and contractile proteins); energy transduction; structure and function of photosynthetic reaction centers; and mechanisms of electron transfer in biological systems. Typical approaches and techniques include: electron microscopy; diffraction; scattering; x-ray absorption, magnetic resonance, infra-red, and other spectroscopies.

Amount of funding available for chemical industry-related R&D:

In FY 95, the program received funding of approximately \$28.7 million.

Length of involvement in chemical industry-related R&D efforts:

Involvement in related efforts have existed since the beginning of NSF in the 1950's.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.
 Internet resources.

Date of last revision: August 29, 1995.

TENNESSEE VALLEY AUTHORITY

The Tennessee Valley Authority conducts a unified program of resource development for the advancement of economic growth in the Tennessee Valley region. The Authority's program of activities includes flood control, navigation development, electric power production, fertilizer development, recreation improvement, and forestry and wildlife development. While its power program is financially self-supporting, other programs are financed primarily by appropriations from Congress.

Federal Agencies Active in Chemical Industry-Related R&D

Tennessee Valley Authority
Environmental Research Center
Post Office Box 1010
Muscle Shoals, AL 35662-1010

Contact: Mr. Keith Rylant
Phone: 205-386-2835
Fax: 205-386-2049
E-mail: Unknown

Description of agency involvement in chemical industry-related R&D:

The Tennessee Valley Authority (TVA) Environmental Research Center provides full-scale scientific applications developed from bench-scale research. The Center's staff offers research applications in areas such as ozone mitigation, pollution prevention, site remediation, and biotechnology.

Areas of chemical industry-related R&D are air quality monitoring, agrichemicals, biofilters, composting, bioremediation, and chemical remediation.

Sample project titles and participation include:

- Constructed Wetlands (Department of Defense, Corps of Engineers, EPA)
- Coal Refinery (TVA)
- Pollution Prevention for Agrichemical Dealers (EPA, state regulators, agri dealers associations)
- Biofilters (private sector)
- Acid Recycling (DOE)

Amount of funding available for chemical industry-related R&D: Unknown.

Length of involvement in chemical industry-related R&D efforts: Unknown.

Relationship to OIT programs (if applicable): None.

Notes:

Sources of information: Personal communication.

Date of last revision: August 10, 1995.

AVAILABLE INTERNET HOME PAGES FOR ADDITIONAL INFORMATION

Department of Agriculture	http://www.usda.gov
Agricultural Research Service	http://www.ars-grin.gov:80/ars/ars.html
Cooperative State Research Service	http://www.csusda.gov
Forest Service	http://www.fs.fed.us
Department of Commerce	http://www.doc.gov
Bureau of the Census	http://www.census.gov
National Institute of Standards and Technology	http://www.nist.gov
Advanced Technology Program	http://atp.nist.gov
Chemical Science and Technology Laboratory	gopher://gopher.csl.nist.gov:7830
Materials Science and Engineering Laboratory	http://www.nist.gov/item/About_NIST_Materials_Science_and_Engineering_Laboratory.html
Department of Defense	http://www.dtic.dla.mil/defenselink/index.html
Advanced Research Projects Agency	http://www.arpa.mil
Defense Science Office	http://webhost.sams.com/arpa/dso
Technology Reinvestment Project	http://www.trp.arpa.mil/trp/trp.html
Department of the Air Force	http://www.af.mil
Office of Scientific Research	http://web.fle.com/web/fed/afr
Department of the Army	http://www.army.mil
Army Research Laboratory	http://info.arl.army.mil
Department of the Navy	http://www.navy.mil
Office of Naval Research	http://web.fle.com/web/fed/onr
Small Business Innovation Research Program	http://web.fle.com/web/fed/onr/onrmainp.htm#sbir
Strategic Environmental Research and Development Program	http://prop.wes.army.mil/serdp/home.html
Department of Energy	http://www.doe.gov
Office of Energy Efficiency and Renewable Energy	http://www.eren.doe.gov
Office of Industrial Technologies	http://www.nrel.gov/oit/oit.html
Office of Building Technologies	http://www.eren.doe.gov/buildings/buildings.html
Office of Transportation Technologies	http://www.eren.doe.gov/transportation/transportation.html
Office of Utility Technologies	http://www.eren.doe.gov/utilities/utilities.html
Office of Energy Research	http://www.er.doe.gov
Basic Energy Sciences	http://www.er.doe.gov/production/bes/bes.html
Advanced Energy Projects Division	http://www.er.doe.gov/production/bes/aep/aephome.html
Chemical Sciences Division	http://www.er.doe.gov/production/bes/chm/chmhome.html
Energy Biosciences Division	http://www.er.doe.gov/production/bes/eb/ebhome.html
Small Business Innovation Research	http://146.138.5.107/sbir.htm
Office of Health and Environmental Research	http://www.er.doe.gov/production/ohet/ohet_top.html
Office of Environmental Restoration and Waste Management	http://www.cm.doe.gov
Office of Fossil Energy	http://www.fe.doe.gov
Department of Health and Human Services	http://www.os.dhhs.gov
Public Health Service	http://phs.os.dhhs.gov/phs/phs.html
Agency for Toxic Substances and Disease Registry	http://atsdr1.atsdr.cdc.gov:8080/atsdrhome.html

Federal Agencies Active in Chemical Industry-Related R&D

Centers for Disease Control	http://www.cdc.gov
National Center for Environmental Health	http://www.cdc.gov/nceh/f/cehweb/nceh/00ceh.htm#nceh.htm
National Institute for Occupational Safety and Health	http://www.cdc.gov/niosh/homepage.html
Food and Drug Administration	http://www.fda.gov/fdahomepage.html
National Center for Toxicological Research	gopher://gopher.ncnr.fda.gov
National Institutes of Health	http://www.nih.gov
National Institute of Environmental Health Sciences	http://www.niehs.nih.gov
National Institute of General Medical Sciences	http://www.nih.gov/nigms
Department of the Interior	http://www.usgs.gov/doi
Bureau of Mines	http://www.usbm.gov
Center for Pollution Prevention and Control	http://www.usbm.gov/ppc/ppc.html
Department of Transportation	http://www.dot.gov
Federal Highway Administration	http://www.dot.gov/dotinfo/fhwa/fhwa.html
Environmental Protection Agency	http://www.epa.gov
Office of Prevention, Pesticides and Toxic Substances	http://www.epa.gov/docs/pesttoxics.html
Office of Research and Development	http://www.epa.gov/docs/ord
National Center for Extramural Research and Quality Assurance	http://www.epa.gov/docs/ord/ncerqa.htm
National Risk Management Research Laboratory	http://www.epa.gov/docs/ord/nrmrl.htm
National Aeronautics and Space Administration	http://www.nasa.gov
Microgravity Sciences and Applications Division	http://microgravity.msad.hq.nasa.gov
Office of Space Access and Technology	http://raiser.oast.hq.nasa.gov/scrs_page/oastfp.html
National Science Foundation	http://www.nsf.gov
Bioengineering and Environmental Systems Division	http://www.nsf.gov/eng/bes/bes.htm
Chemical and Transport Systems Division	http://www.nsf.gov/eng/cts/cts.htm
Chemistry Division	http://www.nsf.gov/mps/chem/chcaa.htm
Design, Manufacture, and Industrial Innovation Division	http://www.nsf.gov/eng/dmi/dmii.htm
Materials Research Division	http://www.nsf.gov/mps/dmr/dmr.htm
Molecular and Cellular Biosciences Division	http://www.nsf.gov/bio/mcb/mcb-pd.htm

ACRONYMS

AEP	Advanced Energy Projects
ARPA	Advanced Research Projects Agency
ARS	Agricultural Research Service
ATP	Advanced Technology Program
ATSDR	Agency for Toxic Substances and Disease Registry
CDC	Centers for Disease Control and Prevention
CO ₂	Carbon Dioxide
CRADA	Cooperative Research and Development Agreement
CSRS	Cooperative State Research Service
DfE	Design for the Environment
DNA	Deoxyribonucleic Acid
DOA	Department of Agriculture
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOT	Department of Transportation
DSO	Defense Sciences Office
EPA	Environmental Protection Agency
ETI	Environmental Technology Initiative
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FSIS	Food Safety and Inspection Service
FY	Fiscal Year
IR	Infrared
METC	Morgantown Energy Technology Center
MSEL	Materials Science and Engineering Laboratory
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NCEH	National Center for Environmental Health
NICE ³	National Industrial Competitiveness through Energy, Environment, and Economics
NIEHS	National Institute of Environmental Health Sciences
NIGMS	National Institute of General Medical Sciences
NIH	National Institutes of Health
NIOSH	National Institute of Occupational Safety and Health
NIST	National Institute of Standards and Technology
NMR	Nuclear Magnetic Resonance
NRMRL	National Risk Management Research Laboratory
NSF	National Science Foundation
OBT	Office of Building Technologies
OIT	Office of Industrial Technologies
OUT	Office of Utility Technologies
PCB	Polychlorinated Biphenyl
PETC	Pittsburgh Energy Technology Center

R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
SBIR	Small Business Innovation Research
SBRP	Superfund Basic Research Program
SERDP	Strategic Environmental Research and Development Program
SIC	Standard Industrial Classification
STTR	Small Business Technology Transfer
TRP	Technology Reinvestment Project
TVA	Tennessee Valley Authority
UV	Ultraviolet
VOC	Volatile Organic Compound

REFERENCES

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National Toxicology Program Fiscal Year 1994 Annual Plan; U.S. Department of Health and Human Services, Public Health Service; May 1994.

Summary of FY 1994 Research in the Chemical Sciences; U.S. Department of Energy, Office of Energy Research, Division of Chemical Sciences; September 1994; DOE/ER-0144/12.

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Abstracts of Phase I and Phase II Awards, Small Business Innovation Research Program 1993; U.S. Environmental Protection Agency, Research and Development; January 1994; EPA 600-R-93-241.

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New Industrial Uses, New Markets for U.S. Crops: Status of Technology and Commercial Adoption; U.S. Department of Agriculture, Cooperative State Research Service; August 1993.

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Small Business Innovation Research (SBIR) Phase I and Phase II Projects Abstracts Book, Fiscal Year 1994; U.S. Department of Health and Human Services.

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Chemical Science and Technology Laboratory Technical Activities 1994; U.S. Department of Commerce, National Institute of Standards and Technology; March 1995; NISTIR 5584.

Advanced Technology Program Proposal Preparation Kit; U.S. Department of Commerce, National Institute of Standards and Technology; November 1994.

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Microgravity Science and Applications Program Tasks and Bibliography for FY 1993; National Aeronautics and Space Administration; March 1994; NASA Technical Memorandum 4569.

Update Form

Please use this form to make updates and/or corrections to information concerning your programs, or attach separate sheet.

If your organization is involved in chemical industry-related R&D and does not appear in this document, and would like to be included in the next edition, please complete this form and mail to:

Bruce Cranford
U.S. Department of Energy
Office of Industrial Technologies, EE-20
1000 Independence Ave. SW, 5F-043
Washington, DC 20585

Contact/Agency: (Please indicate: Contact Name(s), Title, Agency, Address, Telephone, Fax, E-mail)

Description of agency involvement in chemical industry-related R&D: (Please give a brief description of agency's mission and activities. Also include detailed information regarding the chemical industry-related R&D efforts, including achievements and publications.)

Amount of funding available for chemical industry-related R&D: (Indicate available funding for these efforts by fiscal year.)

Length of involvement in chemical industry-related R&D efforts: (Indicate when work began or will begin, date of anticipated completion, or if work is continuous.)

Relationship to OIT programs (if applicable): (Please indicate if program has direct involvement with the Office of Industrial Technologies.)

Notes: (Other pertinent information not previously included.)

 

INDEX

3M	11, 32
agricultural	v, 3-5, 99, 101
Agricultural Research Service	v, 4, 99, 101
Agriculture	iii, v, 2-6, 8, 35, 75, 85, 99, 101, 103
Air Force	v, 17, 19, 21, 22, 99, 103
Air Products	32, 37
AlliedSignal	32
alternative fuels	35, 51
aluminum	33
Amoco	11, 37
Argonne National Laboratory (ANL)	11, 32, 42, 52
Army	v, 17, 19, 23, 24, 99
ARS	99, 101
atmosphere	83
ATMOSPHERIC EMISSION ISSUES	
global warming	78
Battelle	19
Biocatalysis	11, 12
biochemical	44, 58, 88-90, 94
biomass	28, 32, 35-37, 88
Bioprocesses	67
Biotechnology	13, 14, 35, 36, 48, 62, 84, 85, 88, 89, 98
Bureau of Mines	vi, 66-68, 100
Bureau of the Census	v, 10, 99
cadmium	55
capital	1, 46
Carrier	37
Catalysis	11, 12, 33, 42, 47, 90, 94
Centers for Disease Control and Prevention (CDC)	54, 56, 99-101
ceramics	11, 15, 39, 66, 93
CFC	34
chemical engineering	13, 42
Chemical Sciences	vi, 42, 43, 91, 99, 103
Cleaning	28, 32, 39, 72, 78, 80
CO	22, 32, 52, 75
CO ₂	80, 101
Cogeneration	33
commercial	19, 34, 46, 81, 85, 103
commercialization	iii, 11, 26, 32, 35
COMPANIES	
3M	11, 32
Air Products	32, 37
AlliedSignal	32
Amoco	11, 37

Carrier	37
Dow Chemical	11
DuPont	18, 32
Eastman Chemical	11
FMC	32
General Electric (GE)	11
Hughes	18, 19
IBM	18
Monsanto	19
PPG	32
Texaco	37
Computer	18, 26, 39, 48, 74
Congress	5, 19, 25, 54, 71, 72, 97
conservation	3, 4, 28, 31, 42, 65, 69, 88, 102
contract	1
cooperative effort	59
Cooperative State Research Service	v, 99, 101, 103
copper	67
CRADA	101
definition	40
Department of Agriculture	v, 2-6, 8, 35, 75, 99, 101, 103
Department of Commerce (DoC)	v, 2, 9-11, 13, 15, 99, 101, 103, 104
Department of Defense (DoD)	v, 2, 17-26, 28, 98, 99, 101
Department of Energy (DoE)	1, iii, v, vi, 1, 2, 20, 28, 29, 31-35, 37-40, 42-46, 48-52, 98, 99, 101, 103, 105
Department of Health and Human Services	vi, 2, 53-55, 57-61, 63, 99, 103
Department of the Interior	vi, 2, 65-68, 100, 101
Department of Transportation	vi, 2, 69, 70, 100, 101
directed research	48
Dow Chemical	11
DuPont	18, 32
Eastman Chemical	11
economic	iii, 6, 9, 10, 39, 76, 81, 97
economic growth	9, 97
Economics	32, 75, 101
efficiency	40
effluents	8, 22
Electric Power Research Institute (EPRI)	67
employment	1
end-user	2
energy	1, iii, v, vi, 1, 2, 8, 10, 18, 19, 28, 29, 31-46, 48-52, 69, 75, 80, 94, 99, 101, 103, 105
CO	22, 32, 52, 75
coal	51, 98
electric	11, 37, 67, 97
electricity	51
ethanol	5-7, 35

Fossil	vi, 1, 32, 46, 51, 99
hydrogen	37, 38, 45
natural gas	51
oil	47, 51, 69
petroleum	6, 7, 11, 19, 33, 35, 37, 44, 51, 52
waste heat	1, 32
wood	8, 80
energy conservation	28, 31, 69
energy consumption	1
energy research	v, 40, 42, 44-46, 48, 51, 52, 99, 103
environment	vi, 3, 9, 19, 32, 50, 55, 60, 70-72, 74, 75, 84, 101
RCRA	79, 102
SUPERFUND	vi, 54, 60, 102
environmental	iii, v, vi, vii, 1, 2, 4, 11, 18, 19, 26, 28, 29, 32, 42, 44, 46, 48-50, 54, 55, 58-60, 65-68, 70-76, 78, 79, 81, 88-91, 93, 98-103
Environmental Protection Agency (EPA)	vi, 2, 28, 32, 54, 60, 71-81, 98, 100, 101, 103
ethanol	5-7, 35
Federal Government	iii, 15, 19, 31, 37, 46, 61, 79
feedstock	2, 35, 36
fertilizer	37, 97
FMC	32
food	v, vi, 3, 5, 6, 57-59, 100, 101
Forest Service	v, 8, 99
fossil energy	vi, 46, 51, 99
fuel	1, 18, 22, 28, 32, 37, 44, 46, 47, 51, 84
GASES	
ammonia	34
Benzene	55, 74, 81
CFC	34
Chlorofluorocarbons	34
CO	22, 32, 52, 75
CO ₂	80, 101
hydrogen	37, 38, 45
Methane	45, 51
Methanol	18, 32, 35
ozone	28, 78, 98
Toluene	55
VOC	8, 28, 102
Volatile Organic Compound	19, 102
Xylene	6, 7
General Electric (GE)	11
glass	33
Global warming	78
goal	32, 35, 50, 60, 92
GOVERNMENT ORGANIZATIONS	
Air Force	v, 17, 19, 21, 22, 99, 103

Army	v, 17, 19, 23, 24, 99
Bureau of Mines	vi, 66-68, 100
Bureau of the Census	v, 10, 99
Centers for Disease Control and Prevention (CDC)	54, 56, 99-101
Defense Programs	v, 39
Department of Agriculture	v, 2-6, 8, 35, 75, 99, 101, 103
Department of Commerce (DoC)	v, 2, 9-11, 13, 15, 99, 101, 103, 104
Department of Defense (DoD)	v, 2, 17-26, 28, 98, 99, 101
Department of Energy (DoE)	1, iii, v, vi, 1, 2, 20, 28, 29, 31-35, 37-40, 42-46, 48-52, 98, 99, 101, 103, 105
Department of Health and Human Services	vi, 2, 53-55, 57-61, 63, 99, 103
Department of Transportation	vi, 2, 69, 70, 100, 101
Environmental Protection Agency (EPA)	vi, 2, 28, 32, 54, 60, 71-81, 98, 100, 101, 103
Food and Drug Administration (FDA)	vi, 57-59, 100, 101
Forest Service	v, 8, 99
National Aeronautics and Space Administration (NASA)	iii, vii, 2, 19, 83-85, 100, 101, 104
National Institute for Standards and Technology (NIST)	11-15, 99, 101, 104
National Institutes of Health (NIH)	vi, 59-61, 100, 101
National Science Foundation (NSF)	vii, 2, 19, 74, 87, 88, 90-94, 100, 101
Navy	v, 17, 19, 25-28, 99
Office of Energy Efficiency and Renewable Energy	1, v, 1, 32, 34, 35, 37, 99
Small Business Innovation Research (SBIR)	v, vi, 19, 20, 22, 23, 26, 27, 46, 47, 63, 81, 92, 99, 102, 103
Tennessee Valley Authority (TVA)	vii, 2, 97, 98, 102
grant	32, 46, 47, 74, 75, 85, 91
guayule	5
hazardous waste	6, 67
Hazardous Wastes	54, 60
high-risk	31, 40, 46
Hughes	18, 19
Hydrogen Energy Coordinating Committee	38
IBM	18
incentives	75
industrial sector	iii
industrial waste	10
innovation	v, vi, vii, 19, 22, 23, 26, 46, 57, 63, 81, 92, 99, 100, 102, 103
instrumentation	48, 61, 81, 91, 93
laser	23, 47
lead	55
leadership	57, 74
legislative	1
LIQUIDS	
ethanol	5-7, 35
plasma	47
pulp	8
water	3, 4, 27, 28, 32, 34, 37, 65, 71, 76, 88

long-term	31, 48, 70, 92
magnetic	15, 93, 94, 101
material	27, 46, 84
materials chemistry	18, 21, 91
Materials Science	v, 15, 44, 66, 67, 84, 93, 99, 101, 104
materials substitution	2
measurement	13, 47, 48, 79
Mercury	6, 54, 55
merit-selected	87
metallurgy	15
METC	51, 101
minimization	80
Mining	67, 68
Monsanto	19
Morgantown Energy Technology Center	51, 52, 101
multiphase	42
National Aeronautics and Space Administration (NASA)	iii, vii, 2, 19, 83-85, 100, 101, 104
National Institute for Standards and Technology (NIST)	11-15, 99, 101, 104
National Institutes of Health (NIH)	vi, 59-61, 100, 101
NATIONAL LABORATORIES	29, 37, 42, 48, 52
Ames Laboratory	52
Argonne National Laboratory (ANL)	11, 32, 42, 52
Oak Ridge National Laboratory (ORNL)	32, 35, 40, 42, 52
Sandia National Laboratories (SNL)	19, 37, 52
nitrogen	6, 32, 44
non-hazardous	1
nonprofit	85
Oak Ridge National Laboratory (ORNL)	32, 35, 40, 42, 52
objectives	46, 81
Office of Basic Energy Sciences	42, 44
Office of Energy Efficiency and Renewable Energy	1, v, 1, 32, 34, 35, 37, 99
Office of Energy Research	v, 40, 42, 44, 46, 48, 99, 103
Office of Fossil Energy	vi, 51, 99
organics	78, 81
ORGANIZATIONS	
Electric Power Research Institute (EPRI)	67
organometallic	11, 25, 91
Ozone	28, 78, 98
paper	8
patents	9
pesticide	54
photochemical	37, 42
Photosynthesis	44, 94
plasma	47
pollution	vi, 1, 7, 28, 32, 67, 71-75, 78-81, 98, 100
pollution prevention	vi, 1, 7, 28, 32, 67, 72-75, 78-80, 98, 100

polypropylene	11
poultry	6, 7
PPG	32
president	17, 72
private sector	iii, 13, 28, 48, 54, 98
pulp	8
Purification	27, 88
Radiation	15, 42, 48, 71
reaction	37, 90, 94
recreation	65, 97
Recycling	1, 6-8, 32, 67, 70, 98
reduce waste	1
refrigerants	15, 28, 34, 72
regulations	50
regulatory	6, 11, 31, 58, 59, 74
remediation	22, 28, 46, 50, 98
renewable	1, iii, v, 1, 8, 11, 28, 32, 34, 35, 37, 40, 52, 99
risk	vi, 31, 40, 46, 50, 55, 58, 74, 78, 79, 100, 101
Sandia National Laboratories (SNL)	19, 37, 52
Sensing	47
Separation	47, 61, 88
SiC	10, 32, 102
Sintering	85
small business	v, vi, 19, 22, 23, 26, 46, 63, 72, 81, 92, 99, 102, 103
Soldering	23
solicitation	vi, 11, 12, 19, 20, 22, 63, 72, 76
SOLIDS	
aluminum	33
cadmium	55
ceramics	11, 15, 39, 66, 93
copper	67
lead	55
paper	8
sulfur	34
wood	8, 80
zinc	54
solventless	70, 76
source reduction	7, 79
styrene	74
substrates	22, 63, 94
sulfur	34
sulfuric acid	1, 76
Superconducting	93
Supercritical	7, 28, 80
technical assistance	55, 70
TECHNOLOGIES	

biocatalysis	11, 12
bioprocesses	67
biotechnology	13, 14, 35, 36, 48, 62, 84, 85, 88, 89, 98
catalysis	11, 12, 33, 42, 47, 90, 94
cleaning	28, 32, 39, 72, 78, 80
cogeneration	33
computer	18, 26, 39, 48, 74
mining	67, 68
photosynthesis	44, 94
purification	27, 88
radiation	15, 42, 48, 71
recycling	1, 6-8, 32, 67, 70, 98
sensing	47
separation	47, 61, 88
sintering	85
soldering	23
superconducting	93
supercritical	7, 28, 80
treatment	22, 27, 28, 40, 63, 68, 76
ultrasonic	15, 32
Technology Transfer	23, 33, 46, 55, 85, 102
Texaco	37
toxicity	6, 54, 58, 60, 63
transportation	v, vi, 2, 19, 35-37, 69, 70, 72, 99-101
travel	9
Treatment	22, 27, 28, 40, 63, 68, 76
trichloroethane	54
Ultrasonic	15, 32
VOC	8, 28, 102
Volatile Organic Compound	19, 102
water	3, 4, 27, 28, 32, 34, 37, 65, 71, 76, 88
wood	8, 80
zinc	54