
EXECUTIVE DIRECTIVE No. 2006-6

PROMOTION OF GREEN CHEMISTRY FOR SUSTAINABLE ECONOMIC DEVELOPMENT AND PROTECTION OF PUBLIC HEALTH

WHEREAS, Section 1 of Article V of the Michigan Constitution of 1963 vests the executive power of the State of Michigan in the Governor;

WHEREAS, under Section 8 of Article V of the Michigan Constitution of 1963 each principal department of state government is under the supervision of the Governor unless otherwise provided by the Constitution;

WHEREAS, Section 52 of Article IV of the Michigan Constitution of 1963 declares that the public health and general welfare of the People of the State of Michigan are matters of primary public concern;

WHEREAS, the use by persons and entities in Michigan of hazardous substances that can threaten human health and our environment should be reduced;

WHEREAS, "green chemistry" is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances;

WHEREAS, "green chemistry" can be an effective approach to pollution prevention because it applies innovative scientific solutions to real-world environmental situations;

WHEREAS, the field of "green chemistry" holds promise as a way to both reduce the use of hazardous substances and to promote sustainable economic development in Michigan;

NOW, THEREFORE, I, JENNIFER M. GRANHOLM, Governor of the State of Michigan, by virtue of the power and authority vested in the Governor by the Michigan Constitution of 1963 and Michigan law, direct the following:

I. DEFINITIONS

As used in this Directive:

A. "Department of Environmental Quality" means the principal department of state government created under Executive Order 1995-18, MCL 324.99903.

B. "Green chemistry" means chemistry and chemical engineering to design chemical products and processes that reduce or eliminate the use or generation of hazardous substances while producing high quality products through safe and efficient manufacturing processes. Green chemistry is based upon the following 12 principles:

1. Prevent waste: Design chemical syntheses to prevent waste, leaving no waste to treat or clean up.
2. Design safer chemicals and products: Design chemical products to be fully effective, yet have little or no toxicity.
3. Design less hazardous chemical syntheses: Design syntheses to use and generate substances with little or no toxicity to humans and the environment.
4. Use renewable feedstocks: Use raw materials and feedstocks that are renewable rather than depleting. Renewable feedstocks are often made from agricultural products or are the wastes of other processes; depleting feedstocks are made from fossil fuels (petroleum, natural gas, or coal) or are mined.
5. Use catalysts, not stoichiometric reagents: Minimize waste by using catalytic reactions. Catalysts are used in small amounts and can carry out a single reaction many times. They are preferable to stoichiometric reagents, which are used in excess and work only once.
6. Avoid chemical derivatives: Avoid using blocking or protecting groups or any temporary modifications if possible. Derivatives use additional reagents and generate waste.

7. Maximize atom economy: Design syntheses so that the final product contains the maximum proportion of the starting materials. There should be few, if any, wasted atoms.
8. Use safer solvents and reaction conditions: Avoid using solvents, separation agents, or other auxiliary chemicals. If these chemicals are necessary, use innocuous chemicals.
9. Increase energy efficiency: Run chemical reactions at ambient temperature and pressure whenever possible.
10. Design chemicals and products to degrade after use: Design chemical products to break down to innocuous substances after use so that they do not accumulate in the environment.
11. Analyze in real-time to prevent pollution: Include in-process real-time monitoring and control during syntheses to minimize or eliminate the formation of byproducts.
12. Minimize the potential for accidents: Design chemicals and their forms (solid, liquid, or gas) to minimize the potential for chemical accidents including explosions, fires, and releases to the environment.

II. GREEN CHEMISTRY POLICY

A. State departments and agencies shall seek pollution prevention and sustainable economic development through green chemistry by doing all of the following:

1. Encouraging the research, development, and implementation of innovative chemical technologies that accomplish pollution prevention in a scientifically sound and cost-effective manner.
2. Promoting the use of chemical technologies that reduce or eliminate the use or generation of hazardous substances during the design, manufacture, and use of chemical products and processes.
3. Encouraging the use of safer, less toxic, or non-toxic chemical alternatives to hazardous substances to promote sustainable economic development in Michigan.

B. The Department of Environmental Quality shall coordinate the efforts of state departments and agencies to promote green chemistry.

III. GREEN CHEMISTRY SUPPORT PROGRAM

A. The Department of Environmental Quality shall establish a Green Chemistry Support Program to promote and coordinate state green chemistry research, development, demonstration, education, and technology transfer activities in Michigan. Subject to available resources, the Program shall be designed to do all of the following:

1. Provide encouragement for green chemistry research, development, demonstration, education, and technology transfer.
2. Examine methods by which state government can create incentives for consideration and use of green chemistry processes and products.
3. Facilitate the adoption of green chemistry innovations in Michigan.
4. Expand education and training of undergraduate and graduate students, and professional chemists and chemical engineers in Michigan, including through partnerships with industry, in green chemistry science and engineering.
5. Collect and disseminate information on green chemistry research, development, and technology transfer.
6. Provide venues for outreach and dissemination of green chemistry advances such as symposia, forums, conferences, and written materials in collaboration with, as appropriate, industry, academia, scientific and professional societies, and other relevant groups.
7. Support economic, legal, and other appropriate social science research to identify barriers to commercialization and methods to advance commercialization of green chemistry.
8. Provide for public input and outreach to be integrated into the Green Chemistry Support Program by the convening of public discussions, through mechanisms such as citizen panels, consensus conferences, and educational events.

9. Promote voluntary, cooperative efforts with industrial sectors to develop green chemistry plans.

10. Make recommendations to the Governor on an annual basis for a Governor's Green Chemistry Award, promoting excellence, innovation, economic development, and public health risk reduction by businesses and institutions.

11. Maintain a website to provide information about the Green Chemistry Support Program.

B. As part of the Green Chemistry Support Program, the Department shall convene a Green Chemistry Support Roundtable to include representatives of public health, industrial, environmental, local government, and general public perspectives as deemed appropriate by the Department. The Roundtable may establish subgroups organized around particular chemicals or other classes of chemicals to identify the need for green chemistry research and innovation for alternatives.

C. When establishing the Green Chemistry Support Program, the Department of Environmental Quality shall consult with appropriate state departments and agencies, state institutions of higher education, and other interested parties.

IV. MISCELLANEOUS

A. The Department of Environmental Quality shall coordinate state efforts to implement this Directive.

B. All departments, committees, commissioners, or officers of this state or of any political subdivision of this state shall give to the Department, or to any member or representative of the Department any necessary assistance required by the Department, or any member or representative of the Department, in the performance of the duties of the Department so far as is compatible with its, his, or her duties. Free access shall also be given to any books, records, or documents in its, his, or her custody, relating to matters within the scope of inquiry, study, or investigation of the Department.

C. Any suit, action, or other proceeding lawfully commenced by, against, or before any entity affected by this Directive shall not abate by reason of the taking effect of this Directive.

D. The invalidity of any portion of this Directive shall not affect the validity of the remainder of the Directive.

This Directive is effective upon filing.

Given under my hand this 17th day of October in the year of our Lord, two thousand and six.

JENNIFER M. GRANHOLM
GOVERNOR