

17.9: The Eighth Commandment

THE PRODUCTION AND USE OF TOXIC, DANGEROUS, PERSISTENT SUBSTANCES SHOULD BE MINIMIZED AND SUCH SUBSTANCES SHOULD NOT BE RELEASED TO THE ENVIRONMENT; ANY WASTES DISPOSED TO DISPOSAL SITES SHOULD BE CONVERTED TO NONHAZARDOUS FORM

The most fundamental tenet of green chemistry is to avoid the production and use of toxic, dangerous, persistent substances and to prevent their release to the environment. With the caveat that it is not always possible to totally avoid such substances (see the Ninth Commandment below) significant progress has been made in this aspect of green chemistry. Much research is ongoing in the field of chemical synthesis to minimize toxic and dangerous substances. In cases where such substances must be used because no substitutes are available, it is often possible to make minimum amounts of the materials on demand so that large stocks of dangerous materials need not be maintained.

Many of the environmental problems of recent decades have been the result of improperly disposed hazardous wastes. Current practice calls for placing hazardous waste materials in secure chemical landfills. There are two problems with this approach. One is that, without inordinate expenditures, landfills are not truly “secure” and the second is that, unlike radioactive materials that do eventually decay to nonradioactive substances, some refractory chemical wastes never truly degrade to nonhazardous substances. Part of the solution is to install monitoring facilities around hazardous waste disposal facilities and watch for leakage and emissions. But problems may show up hundreds of years later, not a good legacy to leave to future generations.

Therefore, any wastes that are disposed should first be converted to nonhazardous forms. This means destruction of organics and conversion of any hazardous elements to forms that will not leach into water or evaporate. A good approach toward this goal is to co-fire hazardous wastes with fuel in cement kilns; the organics are destroyed and the alkaline cement sequesters acid gas emissions and heavy metals. Ideally, hazardous elements, such as lead, can be reclaimed and recycled for useful purposes. Conversion of hazardous wastes to nonhazardous forms may require expenditure of large amounts of energy (see the fourth commandment, above)

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