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Fact Sheet: MIT Green Chemistry Program

Green Chemistry is the design of chemical products or processes that either reduce or eliminate the use or generation of hazardous substances.

Contact EHS if you would like to:

- Set up EHSA for your lab's chemical inventory needs.
- Offer unwanted chemicals to other labs for exchange.
- Evaluate the potential for recycling acetone or other solvents.
- Get recommendations for greener chemical alternatives.

Ways to make your chemistry greener

- Chemical inventory & sharing
- Chemical exchange
- Chemical purchasing
- Process design
- Greener chemical alternatives
- Greener solvents

Chemical Inventory & Sharing

With a well-maintained inventory, less over-purchasing will lead to less waste being generated. The [Environmental Health & Safety Assistant](#) (EHSA) chemical inventory system facilitates chemical sharing by allowing users to search chemical inventories within their department(s) for chemicals being shared by other labs.



EHSA Logo

Chemical Exchange

The EHS Office coordinates chemical exchanges whereby chemical users put their unwanted chemicals that would otherwise be disposed of up for "exchange" to other users/labs that could potentially use them. Chemical exchange between users saves time and money on both ends by removing and retrieving chemicals at a lab's convenience as well as no disposal nor purchasing costs.

Chemical Purchasing

When purchasing new chemicals, purchase the minimum quantities of commercial chemicals necessary for your work.

Purchase green chemicals. Millipore Sigma is a MIT Preferred Sustainable Provider for Chemistry and offers a variety of greener chemicals at a discounted price. Look for the chemicals marked with green logo when purchasing.



Millipore Sigma
Green Products Logo

Process Design

Design chemical process with 12 Principles of Green Chemistry. Consider waste and hazard prevention during design, rather than disposing, treating and handling waste after a processor material has been developed. Evaluate the greenness of your chemical reactions with [DOZN™ Quantitative Green Chemistry Evaluator](#).

Greener Chemical Alternatives

Substitute the chemical with another comparable chemical which lowers safety, health and/or environmental impacts. Check the [EHS Green Chemistry website](#) for greener chemicals resources.

Greener Solvents

The reduction of hazardous solvents use is one of the most important aims of green chemistry, as organic solvents are often used in large quantities relative to reagents. Refer to the [Green Solvent Guide](#) for greener alternatives. Consider recycling solvents.



Greener Solvent Guide

Key: Hazardous Problematic Preferred

* Indicates Highly Hazardous

For more resources for Green Chemistry in chemistry education: <http://bit.ly/gc-resources>

| Undesirable Solvents | Alternative |
|--|--|
| Pentane, Hexane(s) | Heptane |
| DMF, DMAc, NMP, DMSO | Acetonitrile, Cyrene ^c , Cyclopentyl methyl ether (CPME) ^a , dimethyl carbonate ^c |
| Tetrahydrofuran, Methyl tert-butyl ether (MTBE) | 2-Methyltetrahydrofuran (2-MeTHF), CPME |
| Di-isopropyl ether or diethyl ether* | 2-MeTHF or tert-butyl methyl ether, CPME |
| Dioxane or dimethoxyethane | 2-MeTHF or tert-butyl methyl ether, CPME |
| Chloroform*, dichloroethane* or CCl ₄ * | Dichloromethane |
| Pyridine (as a base) | Triethylamine (Et ₃ N) |
| Dichloromethane (in extractions) | Ethyl acetate (EtOAc), MTBE, toluene, 2-MeTHF |
| Dichloromethane (in chromatography) | EtOAc/heptane ^b , 3:1 EtOAc/EtOH ^b |
| Benzene* | Toluene |
| Acetone | Ethyl lactate ^a |

For a review of organic reactions in water: <http://bit.ly/org-rx-water>

For a review of solvent-free organic reactions: <http://bit.ly/solvent-free-org-rx>

References:

Prati, D., *et al*, *Green Chemistry*, **2016**, *18*, 288–296; Dunn, P. J., *et al*, *Green Chemistry*, **2008**, *10*, 31–36.

a. MilliporeSigma Greener Solvent Alternatives [<https://www.sigmaaldrich.com/technical-documents/articles/analytical/solvents-and-reagents/greener-solvent-alternatives.html>].

b. Toygerly, J.P., *et al*, *Green Chemistry*, **2012**, *14*, 3020–3025.

c. Byrne, F.P., *et al*, *Sustain Chem Process*, **2016**, *4*, 7 1–24.

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References and Additional Resources

- MIT EHS: [Green Chemistry](#)
- MIT EHS: [Chemical Inventory](#)
- Beyond Benign: [Green Solvent Guide](#)
- American Chemical Society: [Green Chemistry Institute](#)
- American Chemical Society: [Solvent Selection Tool](#)
- Millipore Sigma: [Greener Alternative Products](#)
- Millipore Sigma: [DOZN™ Quantitative Green Chemistry Evaluator](#)