

Essentials of Sustainable Chemistry

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Essentials of Sustainable Chemistry

- There are various requirements and benefits of sustainable/green chemistry

- **Human health**

- Clean air

- Clean water



- Increased safety of workers in chemical industry



Essentials of Sustainable Chemistry

- **Continued...(Human health)**
- Safer consumer products
- Safer food
- Less exposure to toxic chemicals as endocrine disrupter



OTHER

BPA, Polycarbonate



- Endocrine disruptor chemicals (EDC) are linked with developmental, reproductive, brain, immune, and other problems.
- EDCs are found in many everyday products, including some plastic bottles and containers, liners of metal **food cans** (used BPA to prevent corrosion), **detergents**, flame retardants (non-sticky pan, electronics, couches), **packaged food**, toys, **fragrance, cosmetics**, and pesticides.
- Examples of some EDCs (Total 293): Bisphenol A (BPA), Dioxins, Perchlorate, Phthalates, Phytoestrogens, Polychlorinated biphenyls (PCB), Triclosan

Essentials of Sustainable Chemistry

- **Environment**

- Green chemicals either degrade to innocuous products or are recovered for further use
- Plants and animals suffer less harm from toxic chemicals in the environment
- Lower potential for global warming, ozone depletion, and smog formation
- Less chemical disruption of ecosystems



- Less use of landfills, especially hazardous waste landfills

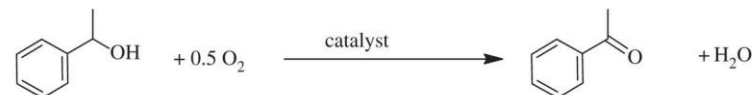


Essentials of Sustainable Chemistry

- **Economy and business**
- Higher yields for chemical reactions, consuming smaller amounts of feedstock to obtain the same amount of product
- Fewer synthetic steps, often allowing faster manufacturing of products, increasing plant capacity, and saving energy and water
- Replacement of a purchased feedstock by a waste product
- Reduced waste, eliminating costly remediation, hazardous waste disposal, and end-of-the-pipe treatments



atom economy = 44 %
E factor > 3
Cr-containing waste



atom economy = 91%
E factor ≤ 0.1
water as waste

- catalyst: water soluble Pd (II) complex
- air as oxidant
- aqueous biphasic system
- no organic solvent
- catalyst recycled via phase separation



Essentials of Sustainable Chemistry

- **Continued....(Economy and business)**
- Better performance so that less product is needed to achieve the same function
- Reduced manufacturing plant size or footprint through increased throughput
- Reduced use of petroleum products, slowing their depletion and avoiding their hazards and price fluctuations
- Improved competitiveness of chemical manufacturers
- Increased consumer sales by displaying a safer-product label



THANK YOU

Any Queries ??...

THANK YOU