

Chemical Wastes

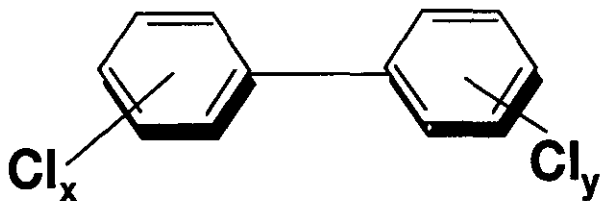
PCBs

Polychlorinated Biphenyls (PCBs)

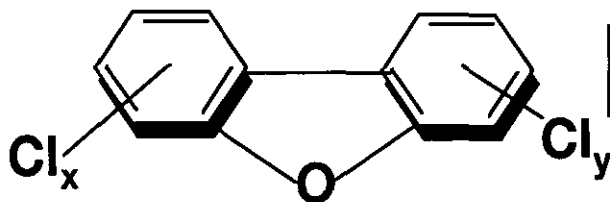
- **Used in electrical equipment**
- **Potentially carcinogenic**
- **Use discontinued (1977-1990)**
- **Need to be safely disposed off**
 - ♦ **Liquid**
 - ♦ **Contaminated equipment**
 - ♦ **Contaminated solids
(e.g., soil, etc.)**



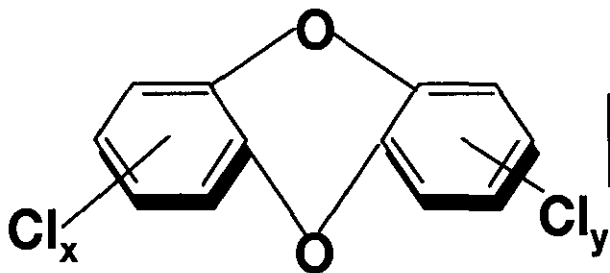
Biphenyl



PCBs ($x+y \geq 2$)



Chlorinated dibenzofurans



Chlorinated dibenzo-p-dioxins

Processes for Destroying PCBs

- **Incineration (> 1200°C)**
- **Cement kiln (incineration)**
- **Plasma arc**
- **Miscellaneous (>80)**

Incineration of PCBs

- Limitations

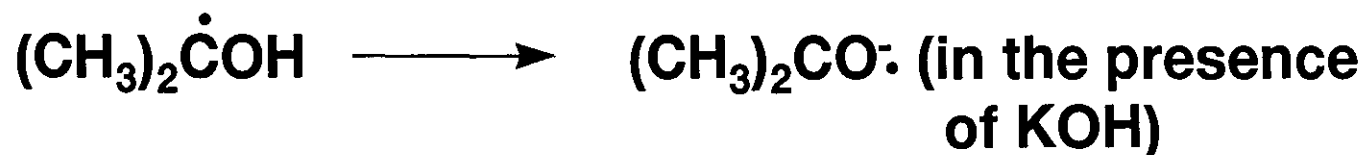
- **Licensing difficult**
 - **License denied in Boston**
- **Solids need to be heated to 1200°C to pyrolyze small amounts (ppm)**
- **Costs \$1-2/kg for liquids, very high for solids**

Radiolysis Process

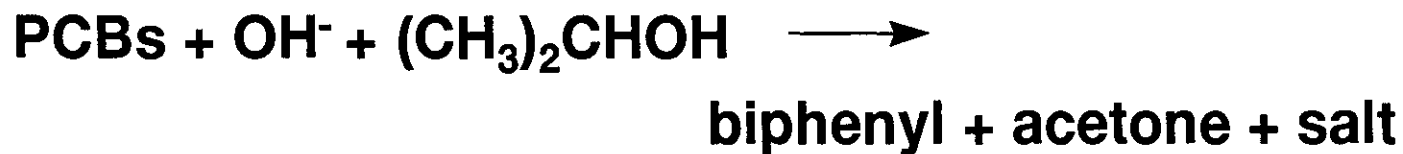
-Advantages

- **Absence of oxygen - no dioxins or dibenzofurans**
- **On-line monitoring**
- **Bulk PCBs and PCB-contaminated items**
- **Toxic waste → useful products**

Key Reactions



Overall reaction



Estimated Costs for Radiation Processing of Liquid PCBs (in 1987\$)

Radiation Source	Maximum Rate (kg/h)	Cost (\$/kg)
Mobile facility (200 kCi Co-60)	9	13.95
Permanent Facility 1 MCi Co-60	101	4.22
40 kW accelerator	195	2.1