

國立臺北大學自然資源與環境管理研究所  
112 學年度第一學期 『環境工程科學概論』

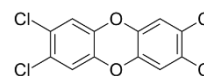
課程講義(04)：環境化學概要  
Introduction to Environmental Chemistry

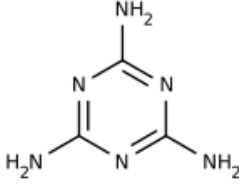
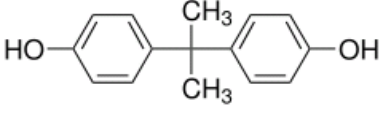
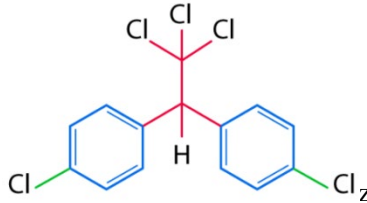
● REVIEW OF BASIC CHEMICAL CONCEPTS

- “Chemistry is the study of matter”
- Atoms, Elements, and the Periodic Table => Isotopes
- Mole, Molar Units (Molarity), and Activity Units
- Chemical Reactions and Stoichiometry
  - ⇒Balancing Chemical Reactions => Stoichiometry
  - ⇒Types of Chemical Reactions: Precipitation-Dissolution Reaction, Complexation Reaction, Oxidation-Reduction (Redox) Reactions
- Chemical Equilibrium
  - ⇒Precipitation ( $K_{sp}$ ), Partial Pressure and Molar Rate (Molarity), and pH
- Chemical Kinetics
- Important Elements
  - ⇒Carbon, Oxygen, Hydrogen, Nitrogen, Sulfur, and Phosphorus
  - ⇒Halogen: Fluorine, Chlorine, Bromine
  - ⇒Heavy Metals: Lead (Pb) 鉛、Arsenic (As) 砷、Cadmium (Cd) 鎘、Mercury (Hg) 汞、Chromium (Cr) 鉻、Other Metals (Atomic Weight > 40)
  - ⇒RoHS Directive => Pb, Cd, Hg, Cr<sup>6+</sup>, 2 Flame Retardants (Polybrominated biphenyls, PBB; Polybrominated diphenyl ether, PBDE)
  - ⇒Greenhouse Gases: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs (Flouro-hydrocarbons), PFCs (Perfluorocarbons), SF<sub>6</sub>, NF<sub>3</sub>
  - ⇒Rare Earth Elements (REE) => Epitaxy (GIS); Silicon crystal => Wafer
- Inorganic Chemicals and Organic Chemicals
  - ⇒Organic Farming and Organic Food
  - ⇒Genetically Modified Organism (GMO)

● ORGANIC CHEMISTRY

- Alkane, Alkene, and Alkynes => 甲烷 Methane、乙烯 Ethylene、丙炔 Propyne
- Aryl (Aromatic) Compounds
  - ⇒BTX (Benzene-Toluene-Xylene) and PAH (Polycyclic aromatic hydrocarbon)
  - ⇒PCB: Polychlorinated biphenyl; PCDDs: Polychlorinated dibenzo-p-dioxins
  - ⇒DDT: di-chloro-diphenyl-tri-chloro-ethane 二氯二苯基三氯乙烷
  - ⇒TCDD: 2,3,7,8-Tetrachlorodibenzo-p-dioxin 四氯聯苯戴奧辛
- Phenol：壬基苯酚 (Nonyl Phenol, NP)；雙酚 A (Bisphenol A, BPA)
- Cyanurotriamine (Melamine) 三聚氰胺
  - ⇒Melamine resin 三聚氰胺-甲醛樹脂 (美耐皿)



 <p>三聚氰胺 (Melamine) Cyanurotriamine 化學式：<math>C_3H_6N_6</math> 1,3,5-Triazine-2,4,6-triamine</p>	 <p>雙酚 A，Bisphenol A (BPA) 化學式：<math>(CH_3)_2C(C_6H_4OH)_2</math> 4,4'-dihydroxy-2,2-diphenylpropane</p>	 <p>滴滴涕，雙對氯苯基三氯乙烷 化學式：<math>(ClC_6H_4)_2CH(CCl_3)</math> Dichloro-Diphenyl-Trichloroethane</p>
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- WATER CHEMISTRY

- State of Solution Impurities
  - ⇒ Distillation, Precipitation, Adsorption, and Liquid Extraction ⇒ Suspensions
- Concentration Units in Aqueous Solutions or Suspensions
  - ⇒ ppm vs. mg/L; Normality and Equivalent Weight
- Transport and Fate of Water Pollutants
- Emerging Water Pollutants

- ATMOSPHERIC CHEMISTRY

- Compressible Fluids vs. Incompressible Fluids
- Composition of the Atmosphere
- Ideal Gas Law and Ideal Gas Constant ⇒ 22.4 L/mole, 24.5 L/mole
- Dalton's Law of Partial Pressures and Henry Constant
- Concentration of Pollutants in Air
  - ⇒ Gaseous vs. Particulate Pollutants ⇒ ppm(v) vs. mg/m<sup>3</sup>
- Photochemical Reactions
- Radiative Forcing and Greenhouse Effect
  - ⇒ Representative Concentration Pathway

- NUCLEAR CHEMISTRY

- $E = mc^2$
- Nuclear Fission vs. Nuclear Fusion
- Radiation and Radioactivity: Nuclear Decay and Half Life
- Decommissioning of Nuclear Power Plants

- HOMEWORK ASSIGNMENT #2 (Due 2023/10/17) :

- (1) 請參考 [環境部化學物質管理署【報乎哩哉】](#) 網頁，定義「環境賀爾蒙」（具有內分泌干擾素特性之化學物質）。「環境賀爾蒙」屬於那一類的「毒性化學物質」？「環境賀爾蒙」又會對人體造成什麼危害呢？
- (2) 據相關媒體報導，2023/09/22 屏東科技產業園區「明揚國際」工廠之大火意外，主因可能是「有機過氧化物」爆炸引起，請整理該化學物質之特性（安全資料表 SDS）並繪製其化學結構圖。