

Structure of Organic and Inorganic Chemical Pollutants and Their Environmental Impact

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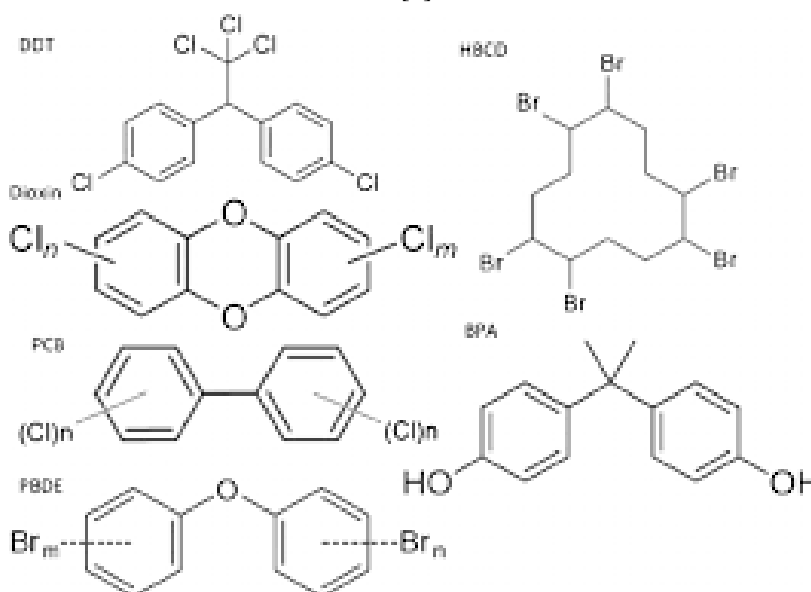
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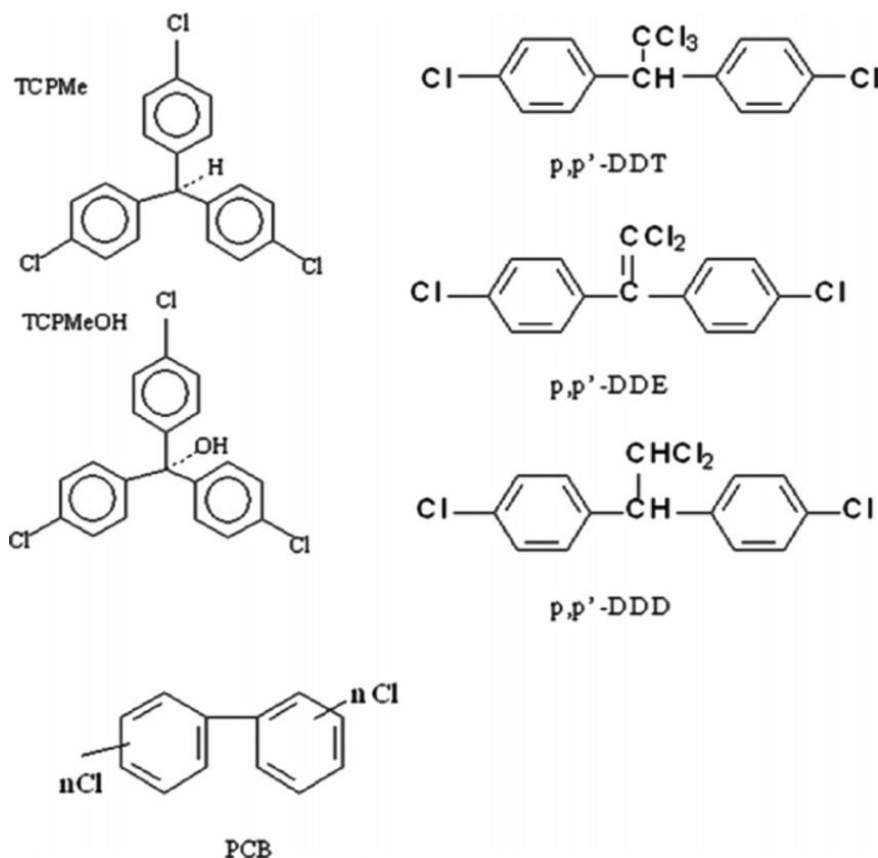
ABSTRACT: Based on their chemical structure, chemical contaminants can be classified into naturally-occurring and man-made categories. They can be organic or inorganic (organic compounds always contain carbon and carbon-hydrogen bonds, whereas most inorganic compounds do not contain carbon). Pollution of the environment by inorganic chemicals is caused by the release of inorganic chemical waste that causes detrimental effects on the environment. Environmental pollution is often divided into pollution of (i) the air, (ii) the water, and (iii) the land or soil. Water supplies the atmosphere and the soil. Because the field of organic chemicals is broad and often refers to hundreds or thousands of several different types of pollutants, including toxic and high concentrations of normally innocuous compounds. While the blame for much of the pollution is caused by the inorganic chemical industry, domestic sources of pollution include waste and automobile exhaust. Individuals and chemical and petroleum companies contribute to the pollution of the atmosphere by releasing inorganic and organic gases and particulates into the air. These chemicals can react with tissues in the body and change the structure and function of the organ, cause abnormal growth and development of the individual, or bind with the genetic material of cells and cause cancer. One of the central tenets of the study of such effects (toxicology) is that the dose of a chemical determines its overall effects and that most chemicals can be dangerous at high exposure.

I. INTRODUCTION

Organochlorine pesticides (such as 1,1,1-trichloro - 2,2 - bis (4-chlorophenyl) ethane (DDT) and its metabolites) and polychlorinated biphenyls (PCBs) are classified as Persistent **Organic Pollutants** (POPs) and are present in the contamination pattern of marine environments world-wide.[1]



DDT



POP

Organic pollutants include phenols, chlorinated phenols, endocrine disrupting chemicals, azo dyes, polyaromatic hydrocarbons, polychlorinated biphenyls, pesticides, etc., whereas inorganic pollutants include a variety of toxic heavy metals such as cadmium (Cd), chromium (Cr), arsenic (As), lead (Pb), mercury (Hg), etc.

Inorganic pollutants include heavy metals and metalloids such as cadmium (Cd), lead (Pb), mercury (Hg), chromium (Cr), nickel (Ni), copper (Cu), zinc (Zn), and arsenic (As).

II. DISCUSSION

Persistent organic pollutants include some organo-metals, such as methylmercury; lipophilic halogenated organics, such as dioxins, polychlorinated biphenyls, chlorinated pesticides, and polybrominated flame retardants; and perfluorinated compounds used as repellants. These compounds are resistant to degradation both in the environment and in the human body and tend to bioaccumulate within the food chain. Persistent organic pollutants cause a variety of adverse health effects, including cancer, immune system suppression, decrements in cognitive and neurobehavioral function, disruption of sex steroid and thyroid function, and at least some of them increase the risk of chronic diseases, such as hypertension, cardiovascular disease, and diabetes. Some compounds are byproducts of industry and combustion. Although the manufacture and use of most man-made chemicals has been reduced in recent years, the levels currently present in the population are still associated with an elevated risk of human disease. Others are still manufactured and used. These are dangerous chemicals that have contaminated even areas remote from the industrialized world, such as the polar regions.[2]

The **inorganic pollutants** and their organic forms have a devastating negative health effects on the flora and fauna of the earth system (atmosphere, hydrosphere, and geosphere) causing several, human health problems (abnormal growth, high risk of cancer, diabetes, obesity, etc.).



III.CONCLUSION

The removal of pathogens as well as inorganic and organic pollutants is one of the main challenges in wastewater purification and water treatment. Due to extensive developments in the last few decades, nanotechnology delivers many products possessing properties with respect to disinfection or pollutant removal. Sorption is the main process to remove metals. Nanoparticles containing CeO₂, zero-valent iron nanoparticles (nZVI), Zn oxide, carbon nanotubes and SAMMS (self-assembled monolayer on a mesoporous support) have been used to efficiently remove heavy metals from water. Metal and metal oxide nanoparticles (e.g. SiO₂ and TiO₂), amorphous titanium phosphate and silica monolith aerogels with different degrees of hydrophobicity possess several functional groups (e.g. hydroxyl moieties) at the surface enabling the sorption of organic pollutants. [3] Dechlorination of organic contaminants such as chloroalkanes and PCBs can be achieved with bimetallic particles (e.g. Pt/Fe, Pd/Fe, Au/Pd). Metals and metal oxides such as TiO₂, α-Fe₂O₃, ZnO have the capability to catalyse photochemical reactions for the degradation of organic pollutants (e.g. phenolic compounds, chlorinated aliphatic and aromatic compounds). Disinfection of water using nanotechnology can be divided into three domains: (a) nanofiltration by membranes produced from nanomaterials such as carbon nanotubes; (b) disinfection using bioactive nanoparticles such as Ag, Cu, ZnO, CeO₂; and (c) advanced oxidation processes (AOP) by TiO₂ or ZnO absorbing light in the UV-range and forming reactive oxygen species such as •OH. Disinfection based on nanoparticles has been described for bacteria, viruses and fungi.[4]

Hazardous organic pollutants represent a threat to human, animal, and environmental health. If left unmanaged, these pollutants could cause concern. Many researchers have stepped up efforts to find more sustainable and cost-effective alternatives to using hazardous chemicals and treatments to remove existing harmful pollutants. Environmental biotechnology, such as bioremediation and phytoremediation, is a promising field that utilizes natural resources including microbes and plants to eliminate toxic organic contaminants. This technology offers an attractive alternative to other conventional remediation processes because of its relatively low cost and environmentally-friendly method. [5,6]

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