



An Overview of Aniline and Chloroaniline Compounds as Environmental Pollutants



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Submission: 📅 August 13, 2017; Published: 📅 May 31, 2018

Abstract

Aniline and chloroaniline are widely used for the synthesis of many industrial useful chemicals. Hence, due to their vast use these chemicals are often observed in the eco-geological system. Because of their continuous long persistence in the environment they might be toxic to human beings, animals and aquatic system. In this review we discussed about their uses, pollution and toxic impact.

Keywords: Aniline; Chloroaniline; Environmental pollution; Toxicity

Aniline and Chloroaniline Compounds Uses, Environmental Pollution and their Toxicity

Aniline and its derivatives are used as mediators in most of different operational fields, for example, synthesis of dyes, plasticizers, pharmaceuticals, pesticides, polymers including polyurethane and rubber additives, photographic chemicals as well as varnishes and also as precursors for amino aromatic derivatives [1-6]. Due to their vast use they often found in the environment. For example, they formed as main intermediates during microbial transformation of nitroaromatic compounds, dinitroaniline, urea, herbicides, triclocarban (antimicrobial agent) and nitropyrenes etc., [7-9]. Activities of extracting of crude oil hydrocarbons frequently causes environmental pollution which might leads to unsafe results for living and non-living combinations of environments [10,11]. If aniline is dispersed in soil, it can quickly enter into the underground water and/or evaporate to an average extent. Hence, in view of the biological accumulation, long term deposit and carcinogenic properties, it might have impact on living systems [12]. Furthermore, anilines and chloroanilines accumulate in soil, undergo numerous spontaneous chemical transformations and turn into non-extractable humic acid like compounds and/or xenobiotics [13-16]. Xenobiotics are released into the ecosystem via manufacturing wastewaters and their direct application to soil resulting in the introduction of carcinogenic and mutagenic chemicals to the ecogeological system. Their prevalence in the surroundings leads to bioaccumulation and can interrupt the conservation balance of the microbial system in soil. Such accumulation in the long run may be hazardous/toxic to the human's health. On the other hand,

xenobiotics are found to be toxic and carcinogenic to living systems [17]. Due to their wide-ranging of toxic impact and carcinogenicity, wastewater containing aniline compound is classified as hazardous waste [10]. The main toxic effects of aniline start with the creation of methemoglobin in blood are expressed by dropping of oxygen carrying, anaemia, jaundice, damage of liver, spleen plus lungs and reduced blood coagulation [18,19]. Chloroanilines are toxic compounds which hinder oxidative phosphorylation and microbial growth. As a membraneotropic material, 4-chloroaniline affects the activity of membrane bound enzymes involved in biosynthesis of lipid molecules [20].

Wastewater containing aromatic amines likes aniline and chloroaniline has been shown to be treated by photolysis, bipolar membrane microbial electrolysis cell-Fenton system, resin adsorption, advanced oxidation processes and microbial biodegradation methods. On the other hand, they are not completely decomposed by activated sludge process and also inhibit biodegradation of other chemicals due to their hard biodegradability in the ecosystem. Hence, there is a need of organisms having the ability to remove these chemicals.

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