Analysis of Some Selected Persistent Organic Chlorinated Pesticides in Marine Water and Food Stuffs by Differential Pulse-Cathodic Stripping Voltammetry

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Abstract
Based on the redox characteristics of two selected organochlorine pesticides namely alachlor (ALC) and chlorfenvinphos (CHL) in Britton–Robinson (B–R) buffer at a hanging mercury drop, Pt and Au working electrode (HMDE), a fast, simple and selective differential pulse cathodic stripping voltammetric (DP CSV) method was developed for their determination. The cathodic stripping peak currents for ALC versus concentrations was linear in the range from 7.4×10^{-9} to 1.4×10^{-7} mol L^{-1} and in the range from 2.7×10^{-9} to 1.6×10^{-8} mol L^{-1} for CHL. The method was applied for the analysis of trace concentrations of ALC and CHL in fresh- and marine water (Atlantic and Red Sea) and sediment samples and food stuffs.

Keywords: Organochlorine pesticides, Stripping voltammetry, Determination, Maine water and sediment, Food stuffs

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1 Introduction

After the Second World War, scientists began to recognize that, certain chemical pollutants were capable persistent in the environment for long time, migrating in air, water, soil and sediments and accumulating to levels that could harm wildlife and human health. These chemical pollutants are called Persistent Organic Pollutants (POPs) [1]. POPs are typically "water-hating" and "fat-loving" chemicals, i.e. hydrophobic and lipophilic. In aquatic systems and soils they partition strongly to solids, notably organic matter, avoiding the aqueous phase [1]. POPs are toxic chemicals, characterized by being subject to bioaccumulation potential and long-range transport capacity [2]. These contaminants are present at different concentrations in sewage sludge and are transferred to soil matrix, as soils have a high capacity to act as reservoirs of organic pollutants [2]. For agrochemical POPs the source is clear – the deliberate application to crops and soils. POPs are also entered our environment from a whole host of combustion sources, from metal refining and as impurities other, deliberately manufactured chlorinated compounds e.g. pentachlorophenol and organochlorinated pesticides (OCPs).

Organochlorine pesticides (OCPs) have been of great concern because of their harm effects, their deleterious effect on nontarget organism, large production and usage, ubiquity, bioaccumulation and magnification in the food chain and persistence in our environment [3]. Herbicides or pesticides, define as a class of chemical substances used against organisms damaging humans, animals and plants, like insects, fungi, moulds, nematoda, and rodents. For their wide spread use and physical–chemical properties, these compounds represent an important class of pollutants for ground and surface water resources. The persistence of pesticides in the water environment depends upon doses, nature (that characterizes resistance to degradation process, dispersion and mobility), pedologic recipient soils and the hydrogeologic characteristics of the area involved. Contamination of ground waters may take a long time, even decades [4,5]. The concept of quality in analytical chemistry is mainly associated with the fact of reaching the maximum level of analytical properties for a given method [6].

Last decades have seen an upsurge of interest on developing precise methods for the determination of persistent organic pollutants (POPs) e.g. chlorinated pesticides, polychlorinated biphenyls in the environment [1]. The determination of pesticides and herbicides in many environmental matrices is generally determined by SPE-LC-ESI-MS/MS [7], UPLC-MS/MS [8], HPLC [9], GC/MS [10,11] and LC-MS/MS [12] and polarographic [15,16] and voltammetric [17–19] methods. Recent years have seen an upsurge of interest for rapid and sensitive analyti-

