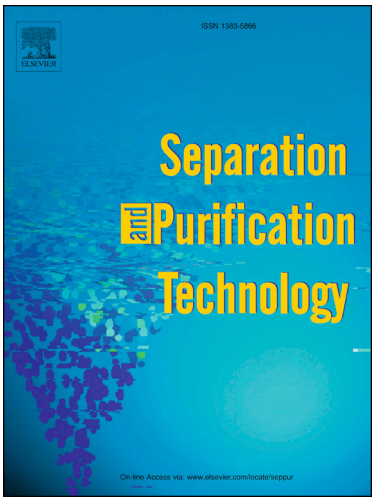

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Removal of organochlorine pesticides (OCPs) from aqueous solutions using hydrogen peroxide, ultrasonic waves, and a hybrid process

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Abstract

The work detailed here investigated the efficiency of oxidizing technologies in clearing aqueous solutions of organochlorine pesticides (OCPs), which are known endocrine-disrupting compounds (EDCs), and an important group of environmental pollutants. The three processes considered entailed oxidation by hydrogen peroxide or ultrasonic waves, as well as a combined H_2O_2/sonication process, with the impacts of time, pH, pesticide concentration and hydrogen peroxide concentration on TOC (total organic carbon) and pesticide removal all tested.

Results confirmed the greater effectiveness of TOC decomposition when ultrasonic waves were assisted by hydrogen peroxide, as opposed to when the process involved hydrogen peroxide (only after 60 min). At the beginning of oxidation, the hybrid process was less effective than that using ultrasonic waves alone. A reaction time has a significant impact on the results. Furthermore, as TOC results failed to offer an accurate reflection of the removal of individual substances from reaction mixture, chromatographic analysis was also carried out following the selected processes. An attempt to identify and characterize the degradation products of the tested pesticides was also made, and most pesticides were found to have been degraded completely. Chromatograms do not suggest any formation of by-products during the oxidation process.

Keywords: Pesticides; OCPs; Hydrogen peroxide; Ultrasonic waves; By-products

1. Introduction

Due to their wide use in agriculture until about 30 years ago, as well as their chemical stability, the organochlorine pesticides (OCPs) became ubiquitous pollutants. They are mainly

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