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γ 辐照和 H_2O_2 联合作用下五氯酚(PCP)的降解

Gamma radiation-induced decomposition of pentachlorophenol(PCP) in the presence of hydrogen peroxide(H_2O_2) in aqueous solution

关键词: [\$\gamma\$ 辐照](#) [五氯酚\(PCP\)](#) [协同效应](#) [过氧化氢\(\$H_2O_2\$ \)](#)

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摘要: 研究了水溶液中的五氯酚(PCP)在 γ 辐照和过氧化氢(H_2O_2)联合作用下的降解。PCP的初始浓度为 $27.7\text{mg} \cdot \text{L}^{-1}$,外加 H_2O_2 的初始浓度为0、50和 $100\text{mg} \cdot \text{L}^{-1}$ 。结果表明,PCP在不同条件下的辐照降解符合准一级动力学方程。当外加 H_2O_2 的初始浓度在 $0 \sim 100\text{mg} \cdot \text{L}^{-1}$ 时,PCP的去除率、矿化率和脱氯率随 H_2O_2 添加量的增加而增大。当吸收剂量为 12kGy 时,PCP几乎完全去除,氯几乎完全释放。然而,总有机碳(TOC)的去除率远低于PCP的去除率。当吸收剂量为 12kGy ,外加 H_2O_2 的初始浓度分别为0.50和 $100\text{mg} \cdot \text{L}^{-1}$ 时,TOC的去除率仅分别为25%、40%和54%。用LC/MS和IC检测了包括羧酸在内的主要中间产物,探讨了水溶液中PCP可能的辐照降解机理。

Abstract: The synergistic decomposition of pentachlorophenol(PCP) was performed by gamma irradiation with hydrogen peroxide(H_2O_2) in aqueous solution. The PCP solution with initial concentration of $27.7\text{mg} \cdot \text{L}^{-1}$ was irradiated in the presence of extra H_2O_2 at initial concentrations of 0, 50, and $100\text{mg} \cdot \text{L}^{-1}$. The experimental results showed that the decomposition of PCP conformed to pseudo first-order reaction kinetics under all applied conditions. When the initial H_2O_2 concentration was in the range of $0 \sim 100\text{mg} \cdot \text{L}^{-1}$, a higher concentration of H_2O_2 was more effective for the decomposition, mineralization and chlorine release of PCP. The removal of PCP and chlorine release were almost complete at an adsorbed dose of 12kGy . However, the removal of total organic carbon(TOC) was not as effective as that of PCP. At an adsorbed dose of 12kGy with initial H_2O_2 concentrations of 0.50, and $100\text{mg} \cdot \text{L}^{-1}$, the removal efficiencies of TOC were only approximately 25%, 40%, and 54%, respectively. Major intermediates, including carboxylic acids were identified by LC/MS and IC. Possible reactions in radiolytic decomposition of PCP in aqueous solution are proposed.

Key words: [Gamma radiation](#) [pentachlorophenol \(PCP\)](#) [synergistic effect](#) [hydrogen peroxide \(\$H_2O_2\$ \)](#)

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