



Hydroxyl-Radical Induced Dechlorination of Pentachlorophenol in Water [1]

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The dechlorination of pentachlorophenol (PCP) in water induced by hydroxyl radicals generated ionizing-radiolytically has been investigated at low PCP concentration under various conditions (different atmosphere or different pH). As shown in Figure 1, PCP consumption and chloride ions release occur simultaneously, both of which increase linearly with the increasing absorbed dose. At relative high absorbed dose PCP could be decomposed almost completely and almost all chloride atoms on PCP molecules (*i.e.* five times of initial amount of PCP) are eliminated. (Fig. 1). From the slope of such linear plots, $G(-PCP)$ is calculated to be 0.4 (air) and 1.5 (N_2O), and $G(Cl^-)$ 1.7 (air) and 7.1 (N_2O). G values also depend on pH of the solutions.

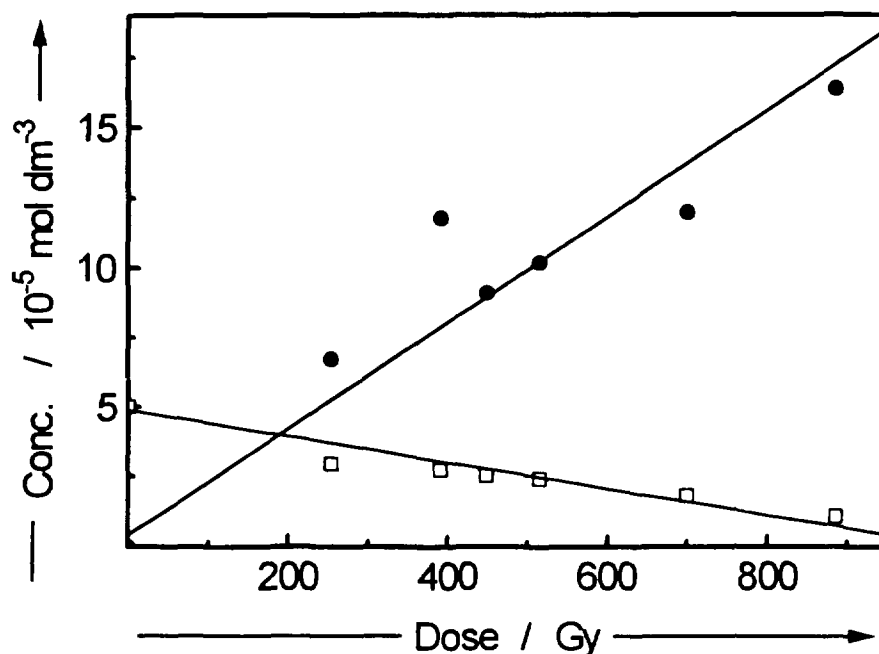


Fig. 1 Dose dependent consumption of pentachlorophenol and release of chloride.

$[PCP]_0 = 4.8 \times 10^{-5} \text{ mol dm}^{-3}$, pH 9, air saturated, dose rate: $0.3\sim 1.6 \text{ Gy s}^{-1}$.

Terzian *et al.* [2] has reported that hydroxyl radicals react with PCP by attacking the benzene ring to generate dihydroxypentachlorocyclohexadienyl, pentachlorophenoxy and semiquinone radicals, and at pH 8 the phenoxy radicals prevail (77%). Phenoxy radicals often react very slowly with O_2 but usually react with $O_2^{\cdot -}$ very fast [3,4]. $O_2^{\cdot -}$ can add to phenoxy radicals and subsequently regenerate phenols by O_2 elimination or result stable adducts. The very low yield of PCP decomposition in air saturated solution (where hydrated electrons are converted into $O_2^{\cdot -}$) indicates that $O_2^{\cdot -}$ react with PCP derived phenoxy radical mainly to regenerate PCP. In the present work pulse radiolysis of PCP has been done to reveal the possible effect of pH on the composition of PCP derived radicals and on their decay kinetics.

References

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