Harnessing hydroxyl radicals generated by hydrodynamic cavitation reactor in simultaneous removal of chlorpyrifos pesticide and COD from aqueous solution

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A B S T R A C T

Harmful recalcitrant compound such as chlorpyrifos, an organophosphate pesticide is present in different environmental matrices due to its wide spectrum application throughout the world. To deal with or remove such compound, various different approaches are adopted and employed. But, in doing so, problems such as efficiency, large scale application, economical aspects, by-product generation, compatibility, etc are raised. Hydrodynamic cavitation (HC) is a cleaner technical process, have ability to produce strong Hydroxyl radicals that can take care of all above said problems. Present work focuses on application of HC reactor in simultaneous removal of model pollutant chlorpyrifos pesticide and chemical oxygen demand (COD) from aqueous solution. Kinetic parameters relating to HC were studied and found that optimum inlet pressure of 5 bars gave 100% chlorpyrifos and 46.7% COD removal. Study relating to number of passes for economical operation reveals that 53 passes were optimum for 56.2% COD removal and 100% chlorpyrifos degradation, acidic pH 4 is more efficient with 55.1% COD removal than alkaline pH 10 with 32.4% COD removal efficiency and has no significant effects on the extent of degradation of chlorpyrifos. Contact time of 2 h yielded maximum COD removal of around 55%. This paper illustrates the HC process, which can be effectively used in field application, with both organic matter in form of COD and recalcitrant compound chlorpyrifos can be treated simultaneously.

Keywords: Chlorpyrifos; Chemical oxygen demand (COD); Degradation; Hydrodynamic cavitation; Efficiency

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