Kinetics study on the oxidation of chlorophenols by permanganate

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ABSTRACT

The kinetics of the oxidation of chlorophenols (CPs) by potassium permanganate was studied in the present study, along with the changes in oxidant dosage, pH, temperature, and real water matrices. The reactions between permanganate and three kinds of CPs, i.e. 4-chlorophenol (4-MCP), 2,4-dichlorophenol (2,4-DCP), and 2,4,6-trichlorophenol (2,4,6-TCP), are second order overall and first-order with respect to each reactant. The degradation rates of the CPs increase with increasing permanganate dosage or temperature. pH plays an important role during permanganate oxidation. With the increase in pH from 4.0 to 10.0, the reaction rates of 4-MCP and 2,4-DCP decrease first and then increase, and finally decrease rapidly when pH > pK\text{a}, while the rates of 2,4,6-TCP decrease continuously. The degradation rates of the CPs are obviously higher in real water than in pure water. The reaction rate follows the order of 2,4,6-TCP > 2,4-DCP > 4-MCP under acidic conditions, and follows the reverse order under alkaline conditions in both pure water and real water.

Keywords: Chlorophenol; Permanganate; Kinetics; Real water