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Kinetics of permanganate oxidation of synthetic macromolecule poly(vinyl alcohol)

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Abstract
Oxidation of poly(vinyl alcohol) (PVA) by permanganate has been studied spectrophotometrically at 525 and 420nm. Under pseudo-first order conditions ([PVA] > [MnO4]), the reaction rate increases with [PVA] and the kinetics reveals complex order dependences [PVA]. The second-order kinetics with respect to [H2S04] at low concentration shifts to first- order at higher concentration. Water soluble colloidal Mn02 has been identified as an intermediate in the reduction of Mn04" by PVA. The hydrogen ions decrease the stability of colloidal Mn02. Poly(vinyl ketone) is found to be the final oxidation product of PVA. Inorganic electrolytes like NaF, Na4P207 and MnCI 2 (a product of the reaction), have inhibitory and · composite effects (inhibition and catalysis) on the reaction rate. Arrhenius and Eyring equations have been used to evaluate the activation parameters. The observed results are discussed in terms of Michaelis-Menten kinetic model. A mechanism has been proposed on the basis of experimental findings.

Author Keywords
Kinetics; Oxidations; Permanganate oxidations; Poly(vinyl alcohol); Reaction mechanisms

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