Applied Catalysis B: Environmental 95 (2010) 179–191

Contents lists available at ScienceDirect

Applied Catalysis B: Environmental

journal homepage: www.elsevier.com/locate/apcatb

Mn^{II}—A fascinating oxidation catalyst: Mechanistic insight into the catalyzed oxidative degradation of organic dyes by H_2O_2

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ARTICLE INFO

Article history:
Received 26 October 2009
Received in revised form 28 November 2009
Accepted 9 December 2009
Available online 29 December 2009

Keywords:
Green catalysis
Manganese salts
Activation of H_2O_2
Oxidative degradation
Organic dyes

ABSTRACT

The use of simple Mn^{II} ions as efficient catalyst precursors for the oxidation of different highly stable organic dyes using H_2O_2 as an environmentally benign oxidant under mild reaction conditions, is presented. The role of a series of aromatic dyes in the in situ formation and stabilisation of the active catalyst was studied in detail using stopped-flow techniques and UV–Vis detection. DFT calculations were employed to predict the nature of the role of the substrate in the stabilisation of highly reactive Mn^{II} intermediates. Furthermore, low-temperature EPR measurements were performed in order to characterize the in situ formed catalytically active Mn^{IV}=O intermediate responsible for the fast and versatile oxidation of organic dyes in aqueous solution.