Mn$^{II}$—A fascinating oxidation catalyst: Mechanistic insight into the catalyzed oxidative degradation of organic dyes by H$_2$O$_2$

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**ABSTRACT**

The use of simple Mn$^{II}$ ions as efficient catalyst precursors for the oxidation of different highly stable organic dyes using H$_2$O$_2$ 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.