Remarkably high catalytic activity of the Ru$^{III}$(edta)/H$_2$O$_2$ system towards degradation of the azo-dye Orange II

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**Figure S1.** UV-Vis spectra recorded for the reaction of $4 \times 10^{-5}$ M Ru$^{III}$(edta) with ($1-5$) $\times 10^{-2}$ M H$_2$O$_2$ at pH 3 (1 mM HNO$_3$) and 25 °C, and kinetic traces recorded at 425 nm.
Figure S2. (a) UV-Vis spectra recorded for the reaction of $4 \times 10^{-5}$ M Ru$^{III}$ (edta) with $2 \times 10^{-2}$ M H$_2$O$_2$ at pH 1 (0.1 M HCl) and 25 °C. (b) Kinetic traces recorded at 390 and 425 nm.
Figure S3. (a) UV-Vis spectra recorded for the reaction of $4 \times 10^{-5}$ M Ru$^{III}$(edta) with $2 \times 10^{-2}$ M H$_2$O$_2$ at pH 5.1 (1 mM acetate buffer) and 25 °C. (b) Kinetic trace recorded at 425 nm.
Figure S4. Absorbance (at 485 nm) versus time trace for the degradation of ORII (a) in the absence of formate and (b) in the presence of 0.01 M formate. [Ru-edta] = 2 x 10^{-5} M, [H_{2}O_{2}] = 1 x 10^{-2} M, pH = 4.0 (1mM acetate buffer). Temp. 21 °C.
Figure S5. (a) Absorbance versus time traces observed at 480 nm following the addition of 5 x 10^{-5} M Orange II to a solution consisting of 2 x 10^{-5} M Ru^{III}(edta) and 1 x 10^{-2} M H_{2}O_{2} after different delay times at pH 1 (0.1 M HCl) and 25 °C. (b) Plot of the calculated first order rate constant versus delay time.
Figure S6. (a) Degradation of 5 x 10^{-5} M ORII following addition of 2 x 10^{-5} M [Ru^{III}(edta)(H_2O)]^- to a mixture of ORII and 1 x 10^{-2} M H_2O_2. (b) Degradation of 5 x 10^{-5} M ORII following addition of 1 x 10^{-2} M H_2O_2 to a mixture of 2 x 10^{-5} M [Ru^{III}(edta)(H_2O)]^- and ORII. Experimental conditions: pH = 4 (1 mM acetate buffer) and 25 °C.
Figure S7. Kinetic stopped-flow traces recorded at 480 nm for the [Ru$^{III}$(edta)(H$_2$O)]$^-$ catalyzed degradation of ORII by H$_2$O$_2$ as a function of pH. Experimental conditions: [Ru$^{III}$] = 2 x 10$^{-5}$ M, [ORII] = 5 x 10$^{-5}$ M, [H$_2$O$_2$] = 1 x 10$^{-2}$ M, Temp. 25 °C. The pH in the range 1 to 3 was adjusted with HNO$_3$, whereas the pH in the range 3 to 5 was adjusted with HNO$_3$ and 1 mM acetate buffer.
Figure S8. Kinetic stopped-flow traces recorded at 480 nm for the [Ru$^{III}$(edta)(H$_2$O)]$^-$ catalyzed degradation of ORII by H$_2$O$_2$ as a function of [H$_2$O$_2$]. Experimental conditions: [Ru$^{III}$] = 2 x 10$^{-5}$ M, [ORII] = 5 x 10$^{-5}$ M, pH = 3.0 (1 mM HNO$_3$), Temp. 25 °C.
Figure S9. Kinetic stopped-flow traces recorded at 480 nm for the \([\text{Ru}^\text{III}(\text{edta})(\text{H}_2\text{O})]^-\) catalyzed degradation of ORII by H$_2$O$_2$ as a function of [Ru(III)]. Experimental conditions: [ORII] = 5 x 10$^{-5}$ M, [H$_2$O$_2$] = 1 x 10$^{-2}$ M, pH = 3.0 (1 mM HNO$_3$), Temp. 25 °C.
Figure S10. (a) UV-VIS spectra of a solution containing \([\text{Ru}^{III}(\text{edta})(\text{H}_2\text{O})]^-\) (2 x 10^{-5} M) and ORII (2 x 10^{-5} M) before (---) and after (----) mixing at pH 4.0 (1 mM acetate buffer). Spectra were recorded in a two-compartmental tandem cell.
**Figure S11.** In situ IR spectra recorded for $[\text{Ru}^\text{III}(\text{edta})(\text{H}_2\text{O})]^-$ (a), ORII (b), ORII (c) (purple), and the mixture of $[\text{Ru}^\text{III}(\text{edta})(\text{H}_2\text{O})]^-$ and ORII (c) (blue). Experimental conditions: $[\text{Ru}^\text{III}(\text{edta})(\text{H}_2\text{O})]^-$ = 2 $\times$ 10$^{-4}$ M, [ORII] = 2 $\times$ 10$^{-4}$ M, pH = 4.0 (adjusted by HCl/NaOH).
Figure S12 Results of HPLC product analyses for the oxidation of ORII by H$_2$O$_2$ in the presence of [Ru$^{III}$(edta)(H$_2$O)]$^2$$. Experimental conditions: (a) [Ru(III)] = 2.5 x 10$^{-5}$ M, [ORII] = 1 x 10$^{-4}$ M, [H$_2$O$_2$] = 1 x 10$^{-2}$ M, pH = 4.0, reaction time prior to analysis 240 s (a) and 3600 s (b). Retention times of phthalic acid, oxalic acid and glycolic acid are 3.13, 3.45 and 3.79 min, respectively, and that of H$_2$O$_2$ is 4.37 min, under the specified experimental conditions (see Experimental Section).