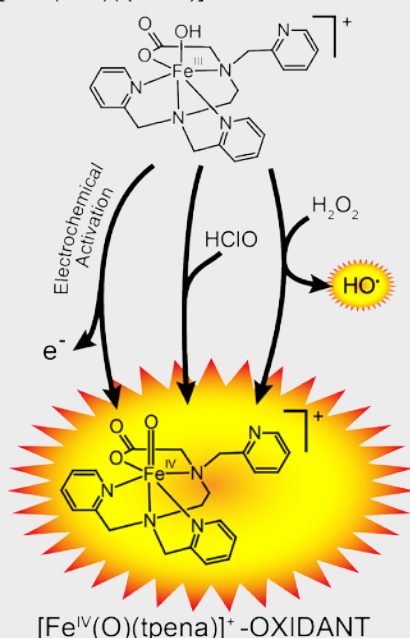


## Biomimetic ligands for oxidative degradation

take inspiration from natural biological enzyme motifs to generate ligands that are both oxidatively robust and capable of stabilizing highly oxidizing high-valent metal species. The oxidizing form can be catalytically generated from the resting state in many ways and employed to degrade a broad variety of contaminants.

$[\text{Fe}^{\text{III}}(\text{OH})(\text{tpena})]^+$  - RESTING STATE



## More information

**Professor David Waite, NAE**

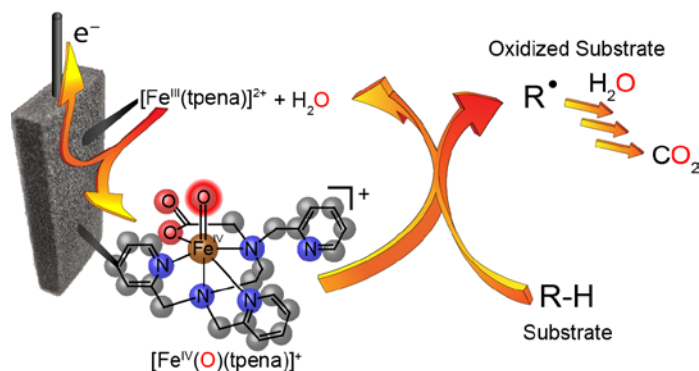
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# Development and use of immobilized biomimetic ligands for oxidative degradation of contaminants

UNSW Water Research Centre, School of Civil and Environmental Engineering



## Competitive advantage

- Oxidation of non-biodegradable and toxic organics such as aromatics, pesticides, and volatile organic compounds;
- Selective oxidant, which is strong enough to achieve full mineralization to  $\text{CO}_2$ ;
- Versatile activation of high-valent oxidant by either electrochemical methods or by addition of a chemical oxidant;
- Ligand is stable to high-valent oxidation state allowing complex to be reused catalytically many times;
- Oxidizing capacity of high-valent state effective over broad pH window, from strongly acidic to alkaline pH.

## Recent research projects

- Demonstration of electrochemical activation of the  $[\text{Fe}^{\text{IV}}(\text{O})(\text{tpena})]^+$  oxidant, and characterization of its reactivity as a function of pH towards a wide variety of substrates;
- Demonstration and mechanistic study of formation of  $[\text{Fe}^{\text{IV}}(\text{O})(\text{tpena})]^+$  and  $\text{HO}^\bullet$  oxidants during  $\text{H}_2\text{O}_2$  activation;
- Demonstration of  $\text{HClO}$  activation of  $[\text{Fe}^{\text{IV}}(\text{O})(\text{tpena})]^+$  oxidant.

## Successful applications

- Degradation of dye contaminants using all activation methods
- Demonstration of complete mineralisation by all activation methods by oxidation of formic acid to  $\text{CO}_2$

## Our experts

- **Professor David Waite, NAE**  
Executive Director/CEO, CTET

