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Light-Activated Oxidation of the Ligand of an Iron(III) Complex

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Oxidative C-N Cleavage in a Carboxylato Ligand

Which pathway (a), (b) or (c)? And how many steps? I.e. CH₂OH, CH₂O, CO₂, CH₃COOH are all possible C₁ and C₂ products amounting to the sum of a C₂H₃O₂ loss

Light-Induced Intermediate

An transient yellow species with λₓmax = 384 nm is formed, when solutions of [Fe(tpena)]²⁺ are irradiated. The 555 nm band due to [Fe(SBPy₃)(MeCN)]²⁺ appears subsequently.

Proposed Reaction Mechanism

Detection of the Organic Products

Head-space IR spectroscopy was used to confirm the release of CO₂ (2360 nm and 2338 nm) and the Hantzsch reaction was used to detect the formation of formaldehyde. Simultaneous detection and quantification of the CO₂ and CH₂O evolution indicated a 1:1 ratio release of CO₂ and CH₂O verifying the proposed mechanism and eliminating CH₃OH and CH₃COOH as by-products.