Synthesis of a Phenanthrene-3,6-diol Iron Complex

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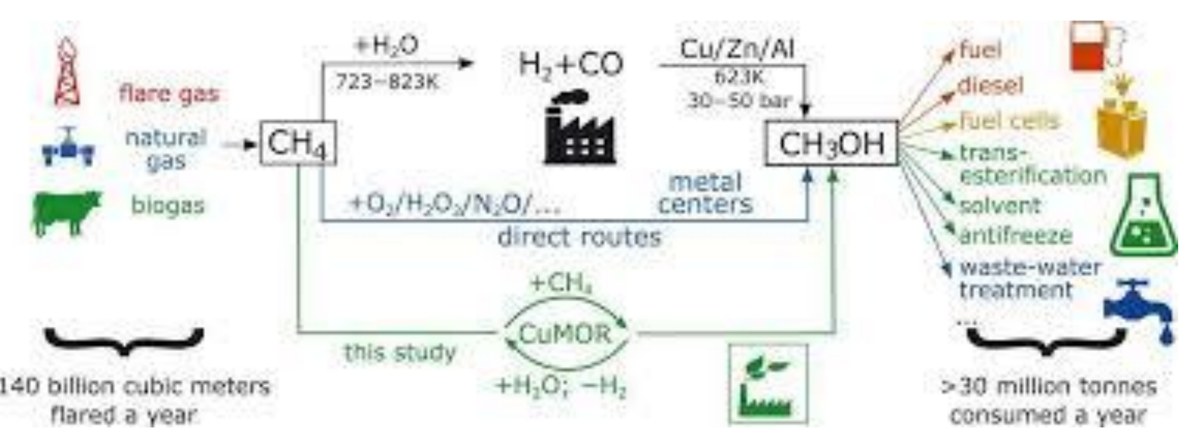
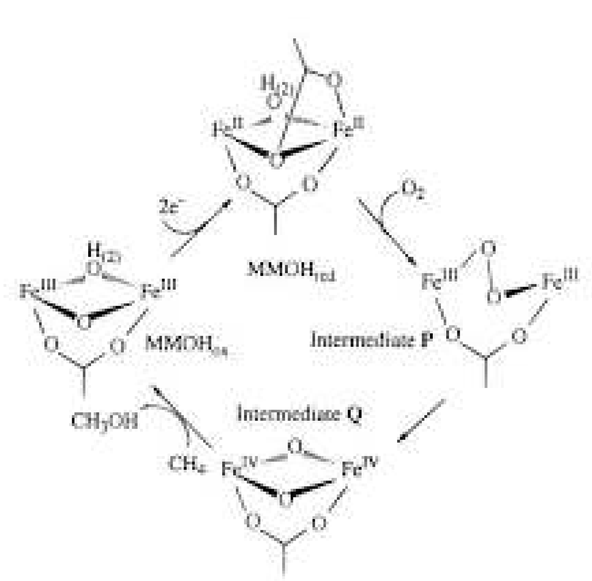
Background



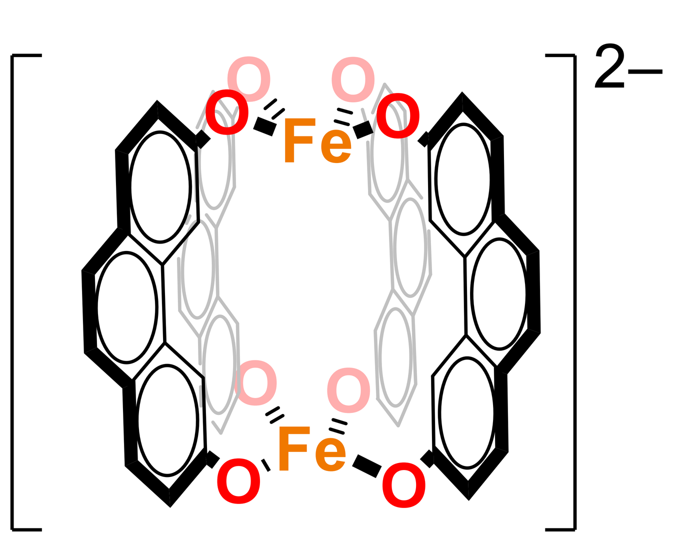
Methane is an abundant greenhouse gas that contributes to global warming. A biologically active enzyme, soluble methane monooxygenase (sMMO), is able to to oxidize methane to methanol in one step. Methanol has many uses in organic syntheses and can be used in automobiles as fuel or antifreeze.

Project Goal

The overall goal was to synthesize a diiron complex similar to the structure of the active site within sMMO because this converts methane to methanol. Due to the similarities between the active site and the goal compound, including a diiron core and oxygen ligands, it can be hypothesized that the synthesized complex will carryout the same process as the sMMO active site.

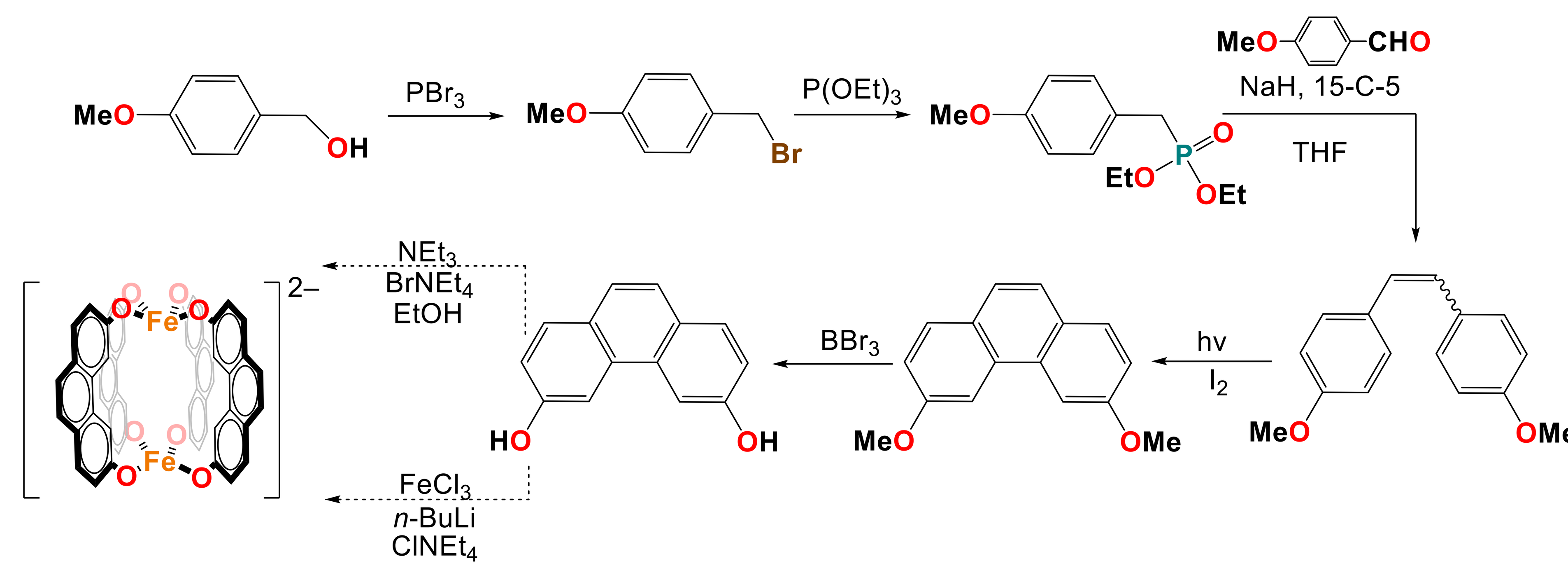


sMMO Active Site

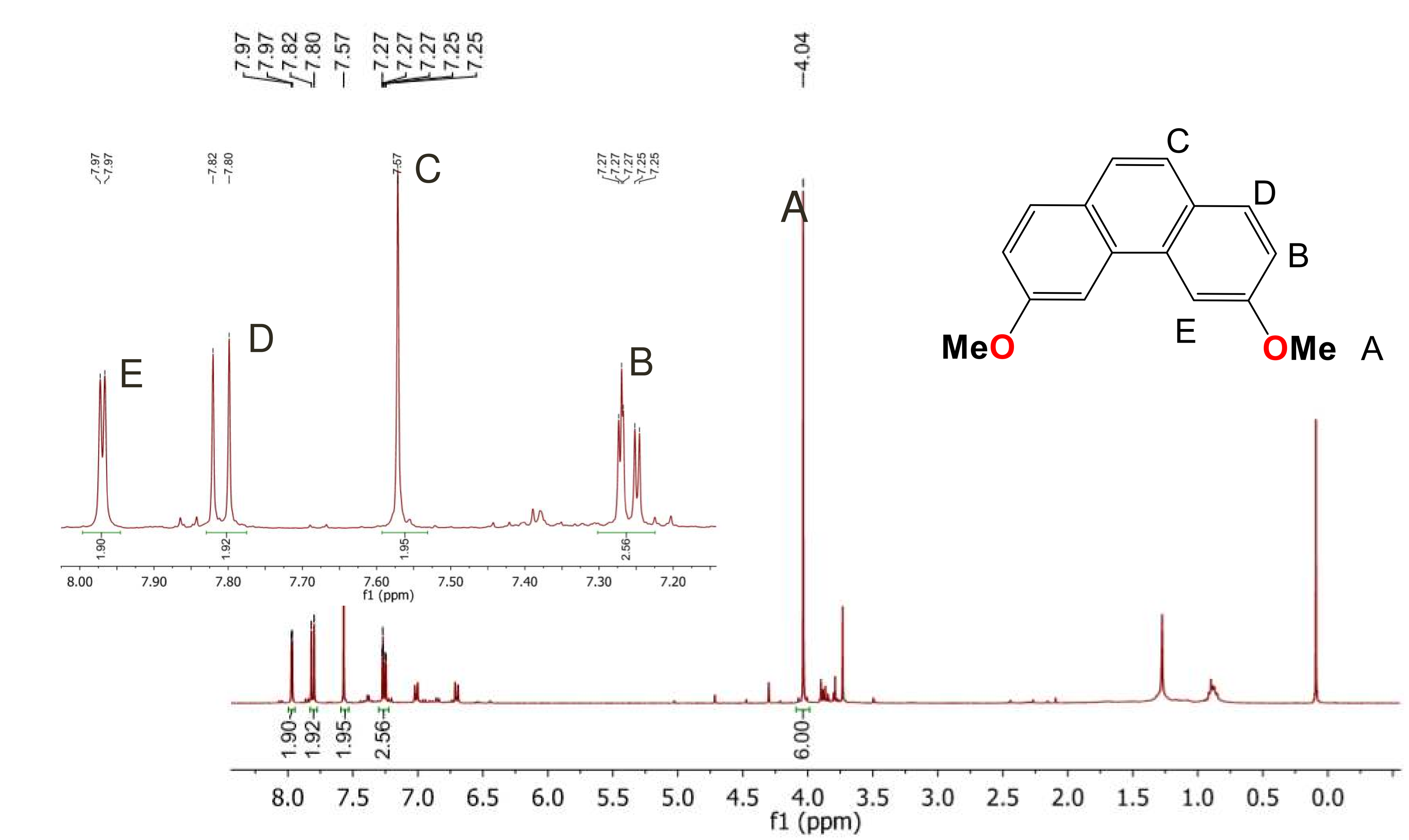


Our goal compound

Synthetic Scheme for Iron Complex

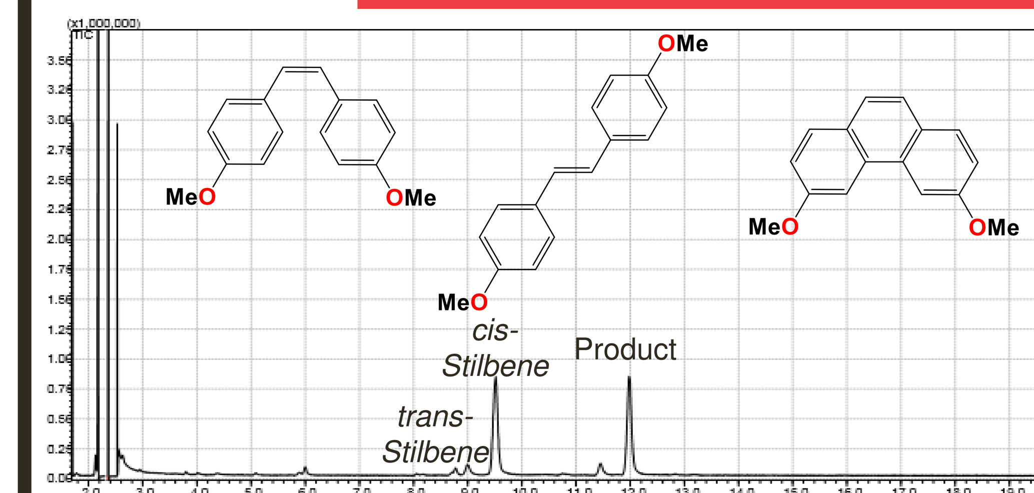


[1]H NMR Spectrum of Compound 5

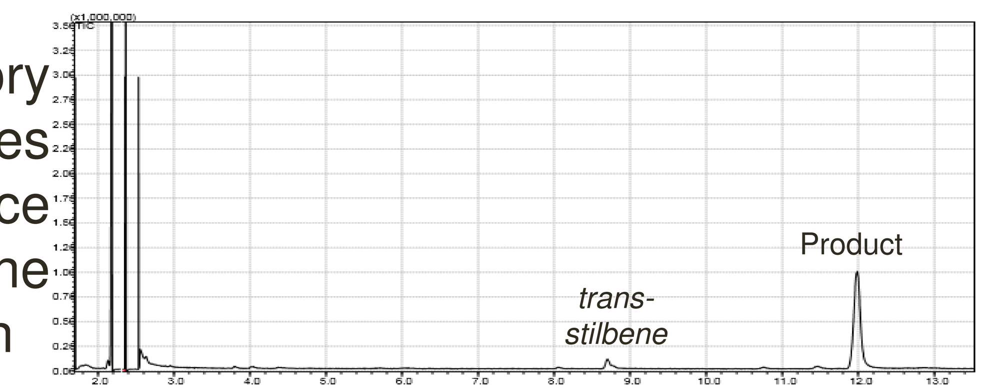


Solvent: $CDCl_3$

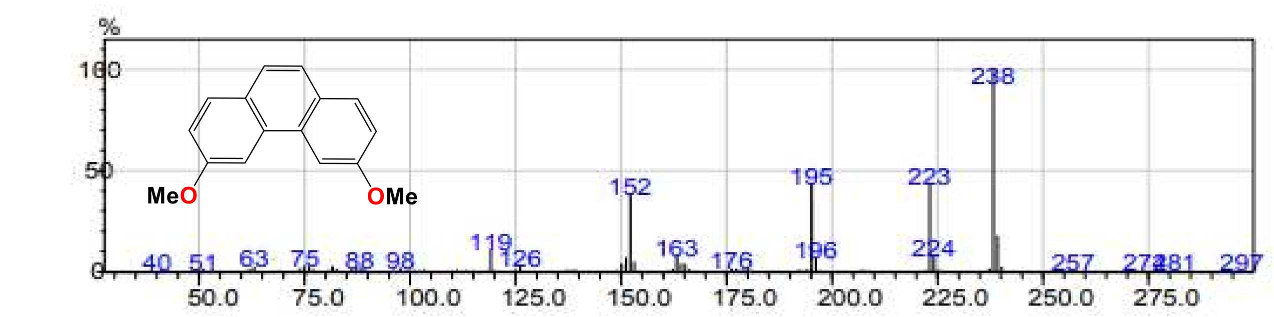
GCMS



Gas Chromatograph showing *cis*- and *trans*-stilbene as well as the phenanthrene product forming



As the Mallory reaction approaches completion trace amounts of the stilbene can be seen



Mass spectrum of the dimethoxyphenanthrene product

Conclusions

- Completed a five-step synthesis of a phenanthrene-3,6-diol pro-ligand
- All compounds were characterized by [1]H NMR spectroscopy and Gas Chromatography-Mass Spectroscopy
- Future work will include coordinating our ligand to a diiron complex via a salt metathesis reaction
- Once diiron complex is successfully synthesized we will attempt catalytic conversion of methane to methanol

Acknowledgements

Chestnut Hill Chemistry Department, my colleagues, and Dr. Kimberly Mullane
University of the Sciences and Dr. Walter Dorfner

References

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