

The Synthesis of a Bimetallic Cryptand Complex for Ammonia Oxidation

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Abstract

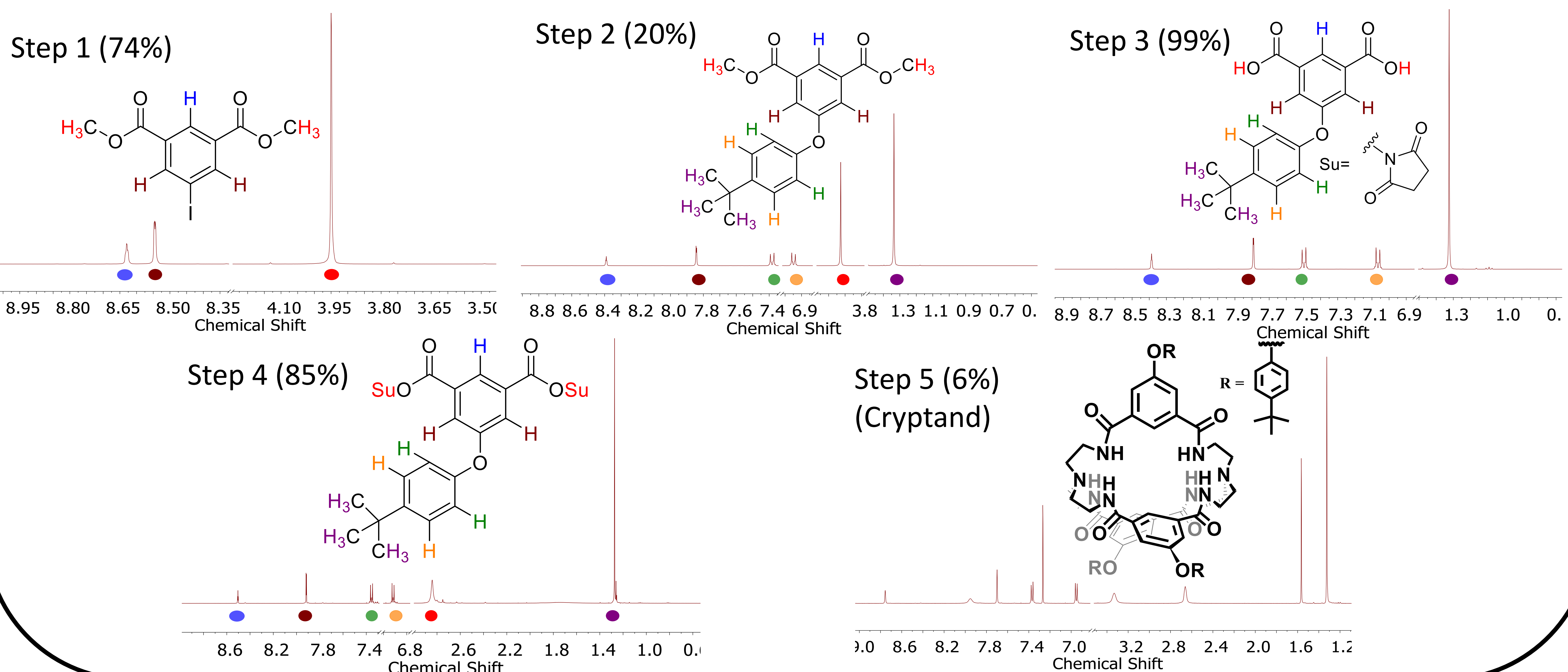
The enduring undesirable impact on the planet caused by fossil fuels highlights the importance of researching cleaner alternative energy. Hydrogen can be a cleaner alternative to fossil fuels, however, it is difficult to store. We propose that ammonia can be employed as an efficient storage medium for hydrogen. Utilizing abundant first row transition metals, we aim to create a bimetallic cryptand complex to effectively oxidize ammonia and the development of technologies to consume the hydrogen released from the reaction. Metal cryptand complexes have been synthesized and further characterization and possible catalytic properties are currently being investigated.

Methods

The compounds were synthesized then characterized using NMR spectroscopy.

Results

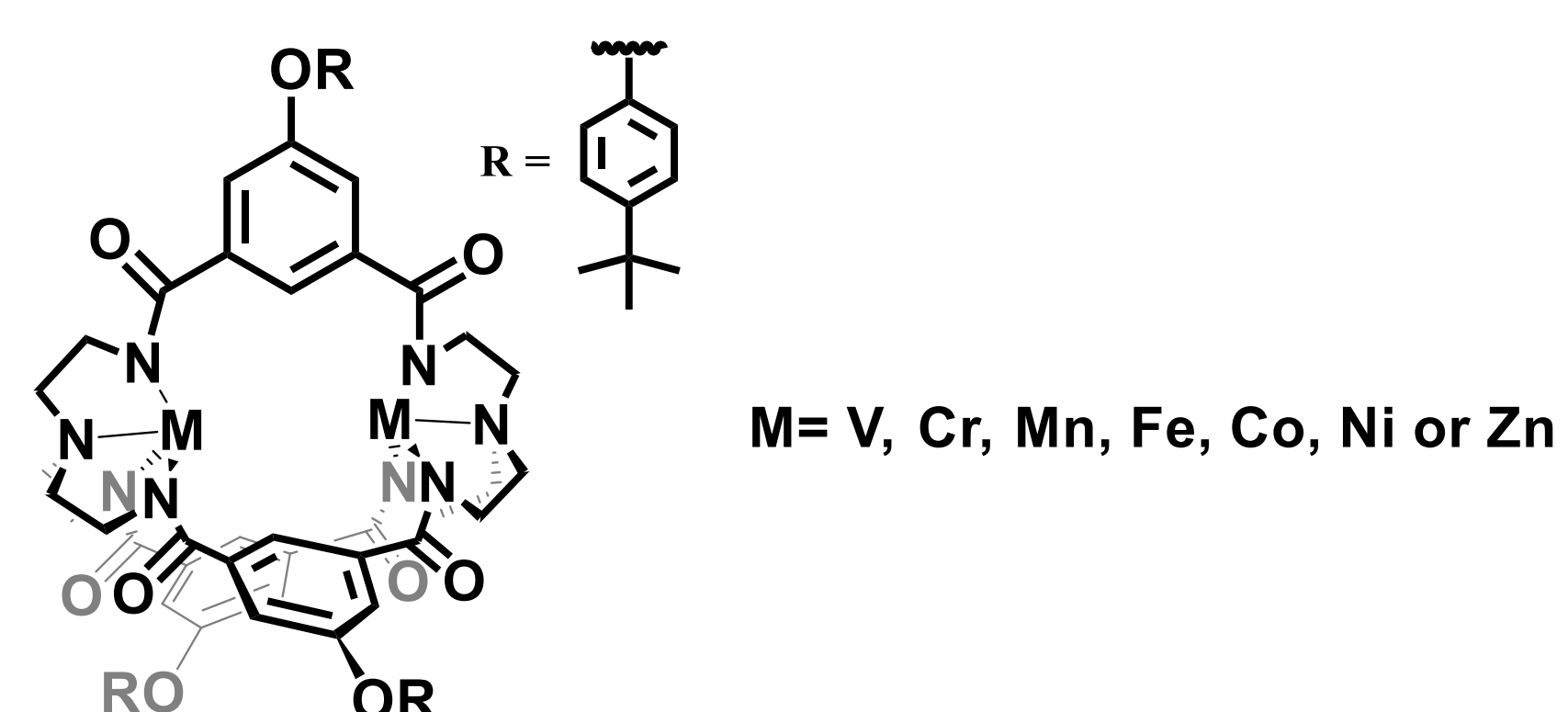
To create our complex we first had to create a cryptand ligand. We successfully created the ligand by following a five step synthesis. The NMR spectra for each of the products from the synthesis along with their yields are shown below.



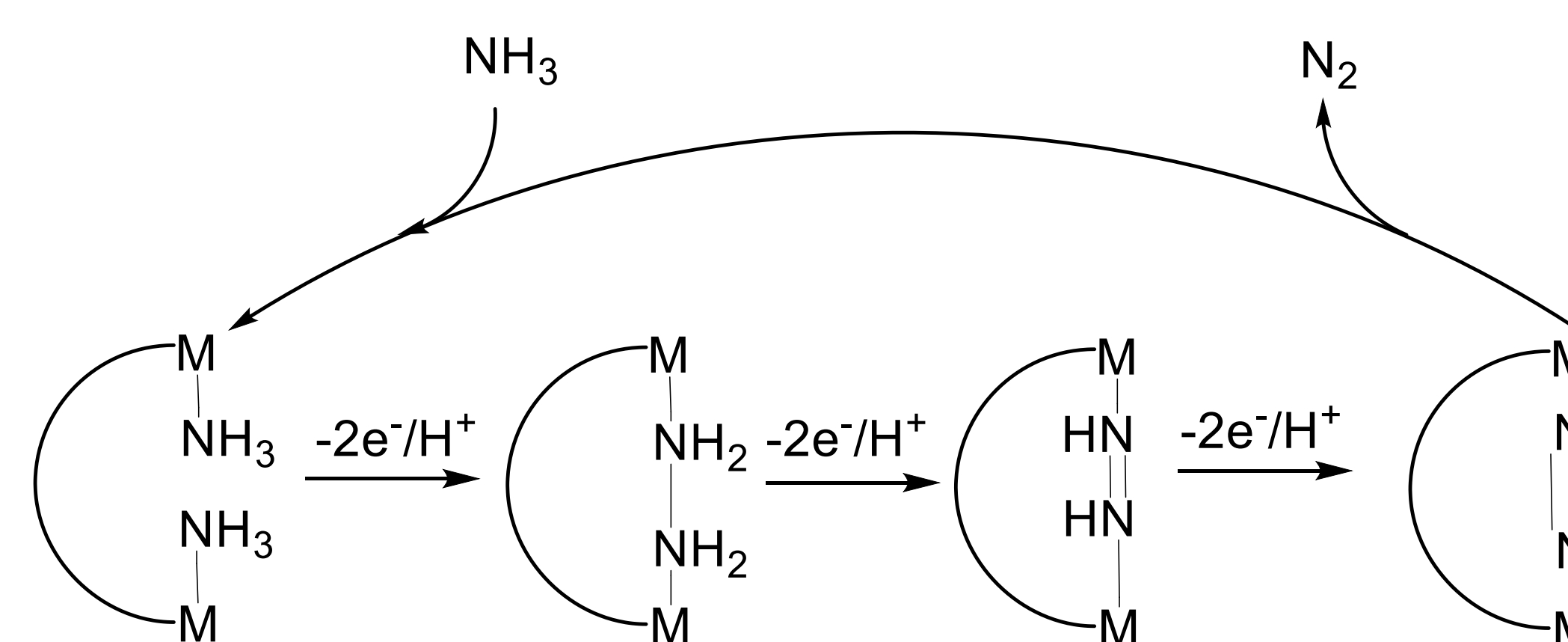
Moving Forward

We aim to synthesize an array of cryptands containing 3rd row transition metals. Once the cryptands have been synthesized we will look into hydrogen coupling systems and possible catalytic properties will be investigated. We hope to eventually create a catalytic cycle for ammonia oxidation.

Complete Bimetallic Cryptand Complex



Proposed Catalytic Cycle



References

Alliger, G. E., Müller, P., Cummins, C. C., & Nocera, D. G. (2010). Cofacial Dicobalt Complex of a Binucleating Hexacarboxamide Cryptand Ligand. *Inorganic Chemistry*, 49(8), 3697–3699.

