The Synthesis of Bimetallic Cryptand Catalysts for Ammonia Oxidation

By Rachel Garwick

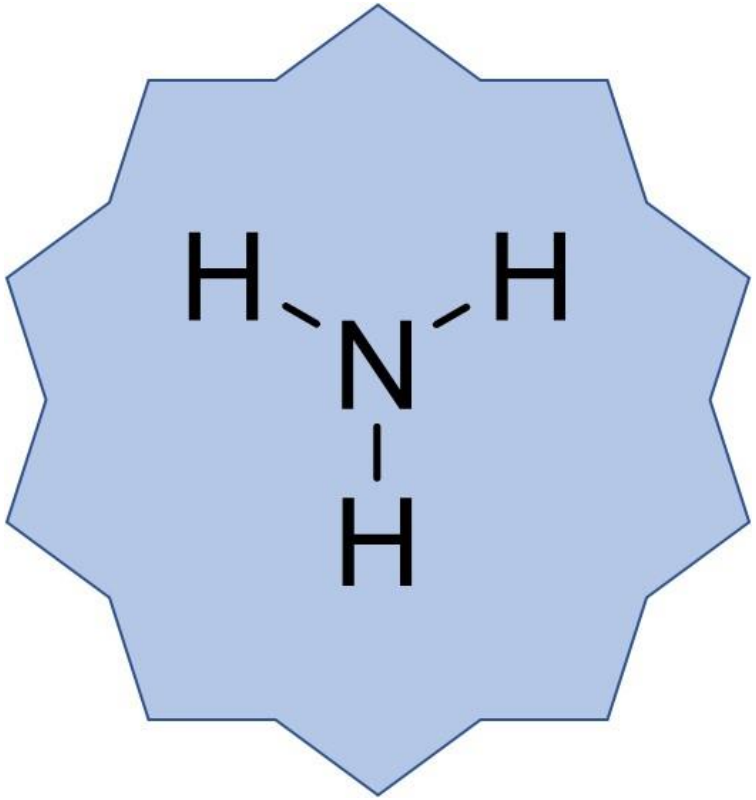
Samuel Jacob

Gabriel Ménard

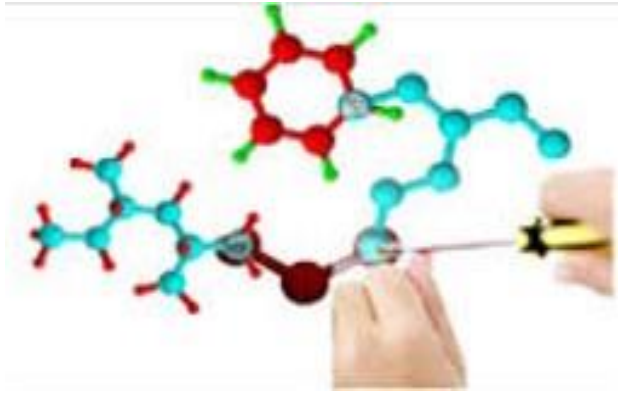
Department of Chemistry and Biochemistry

Why Ammonia?

- Hydrogen is difficult to store
- Haber Bosch Process
- Why not water?



Synthesizing the Complex



1. Synthesize Cryptand

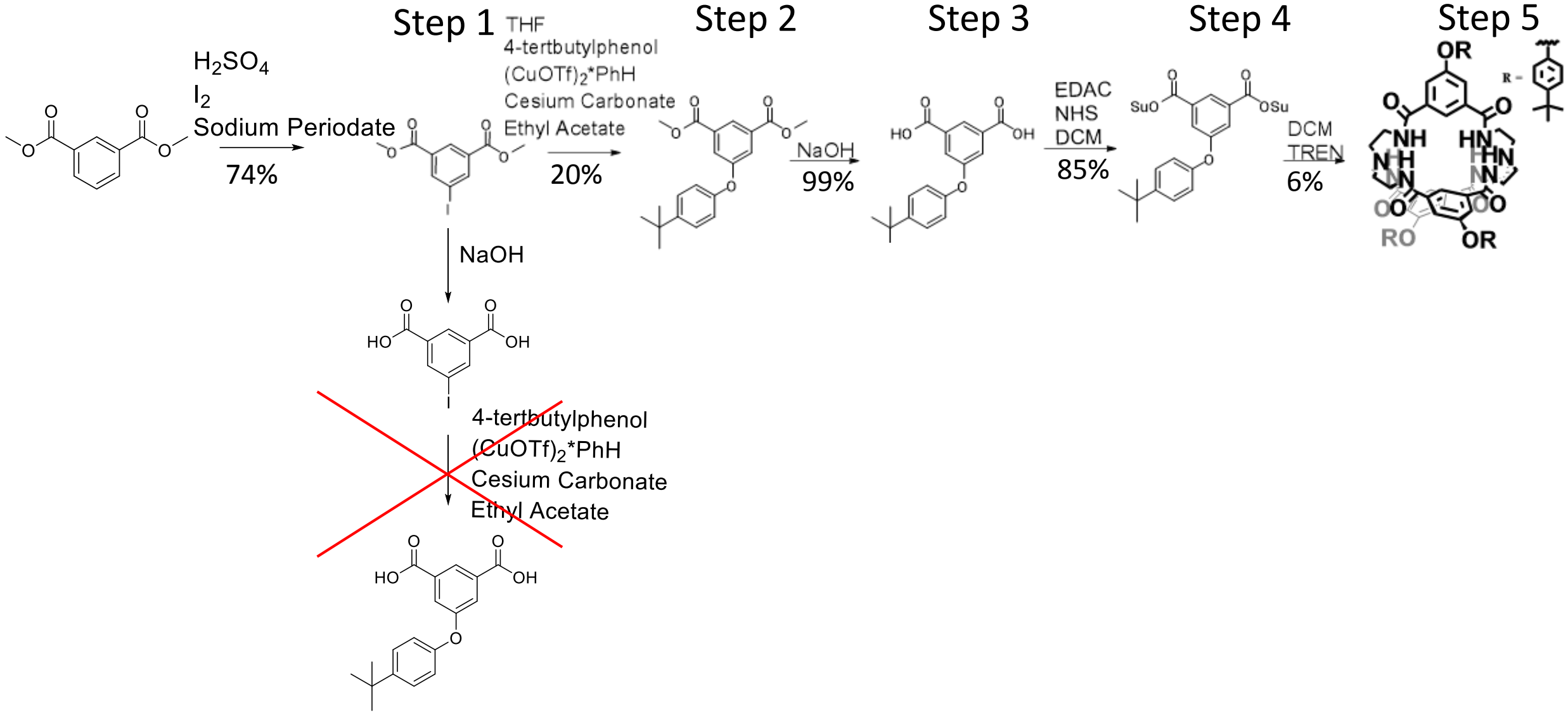
Transition Metals

3	4	5	6	7	8	9	10	11	12
21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39
39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (97.91)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4
71 Lu 175.0	72 Hf 178.5	73 Ta 180.9	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6

2. Add Metals

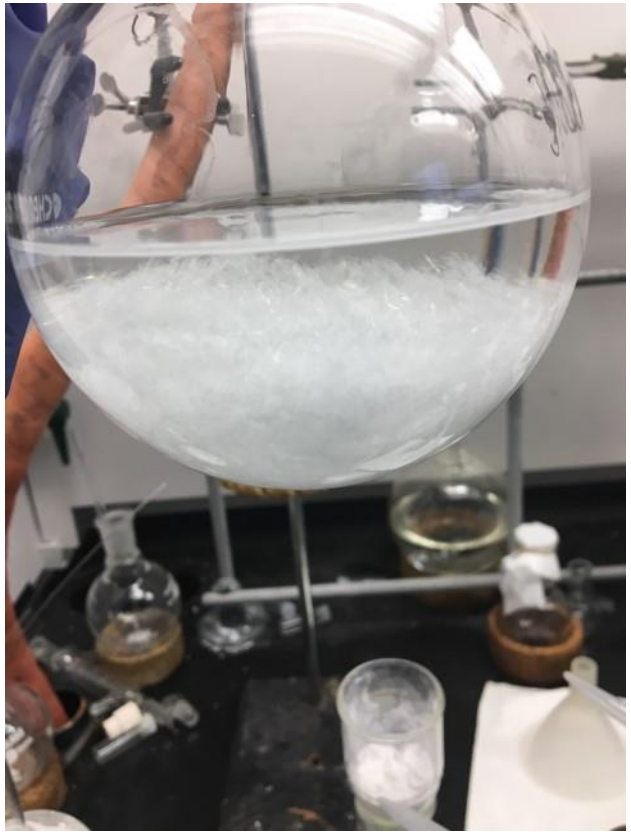
3. Refine Synthesis

Making the Ligand Step by Step



Isolating the Products

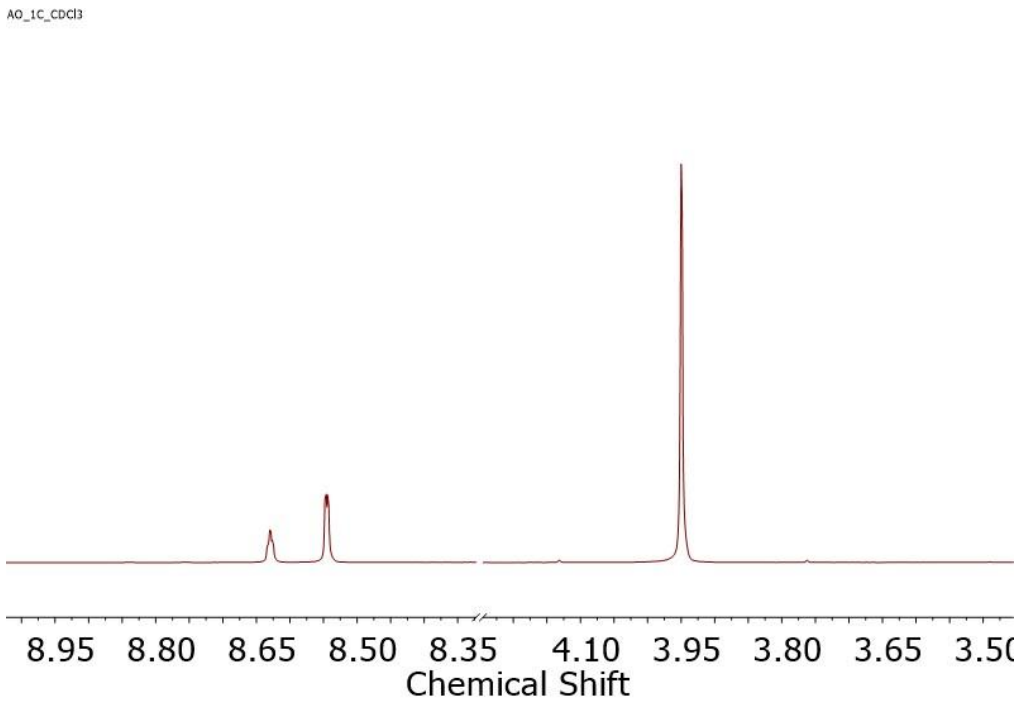
Column Chromatography



Recrystallization

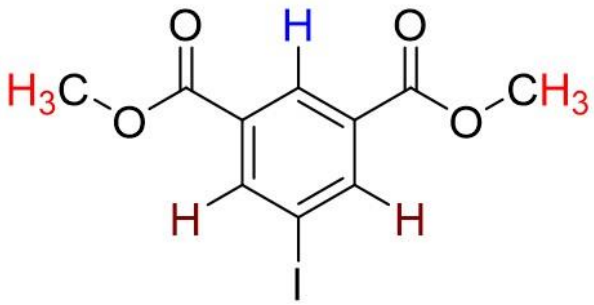
Analyzing our Products

Nuclear Magnetic Resonance (NMR) Spectroscopy

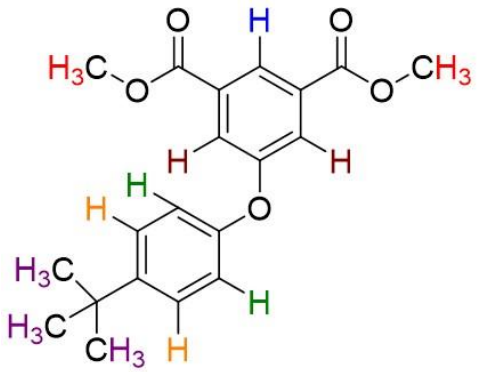


Characterizing the Products

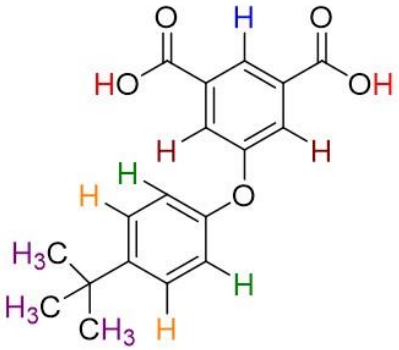
Step 1



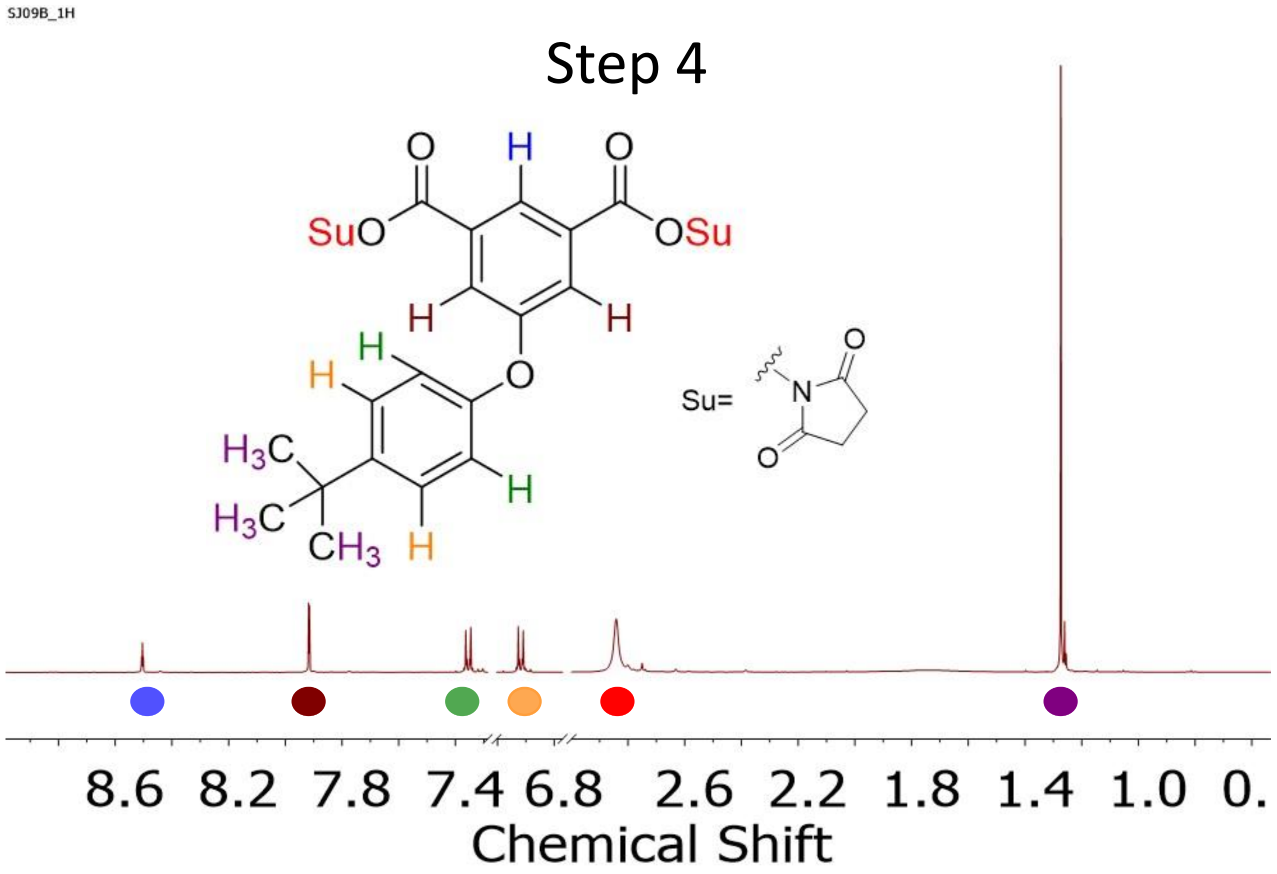
Step 2

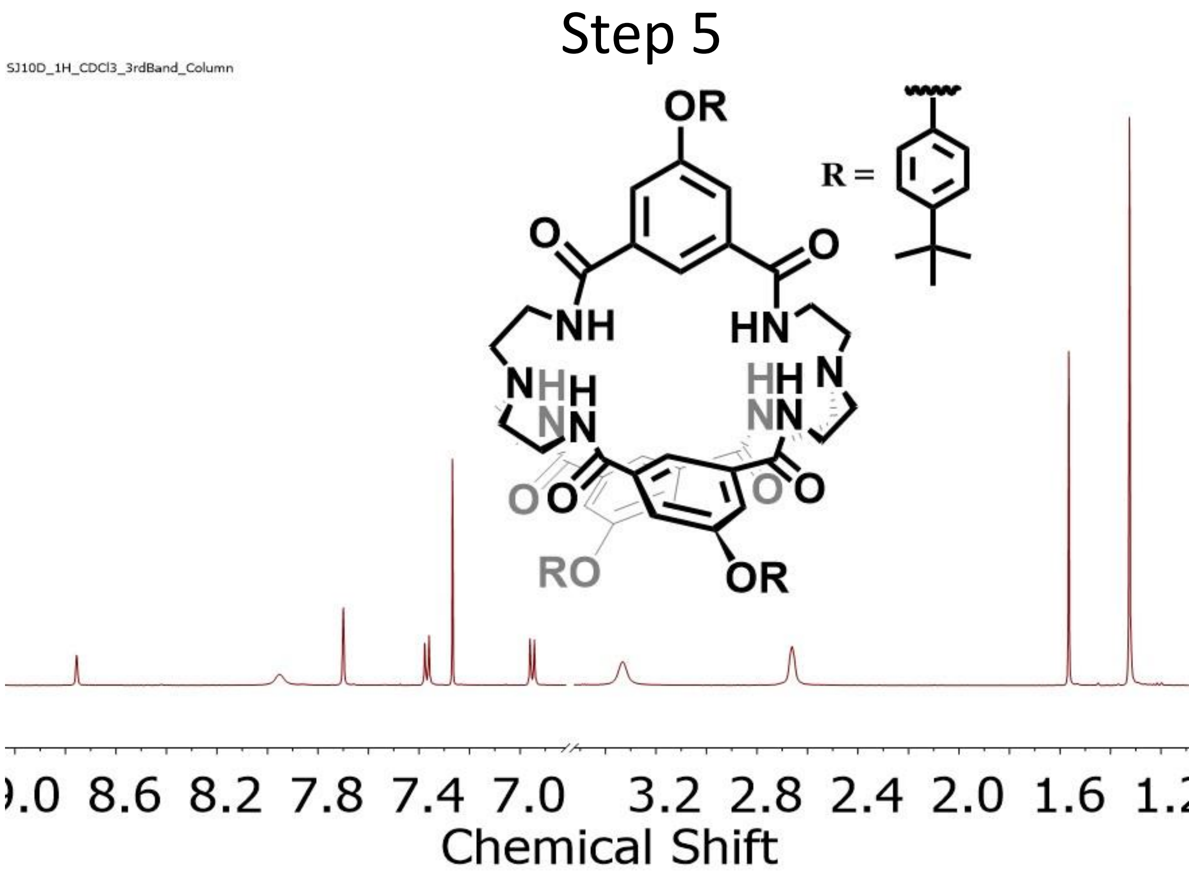


Step 3



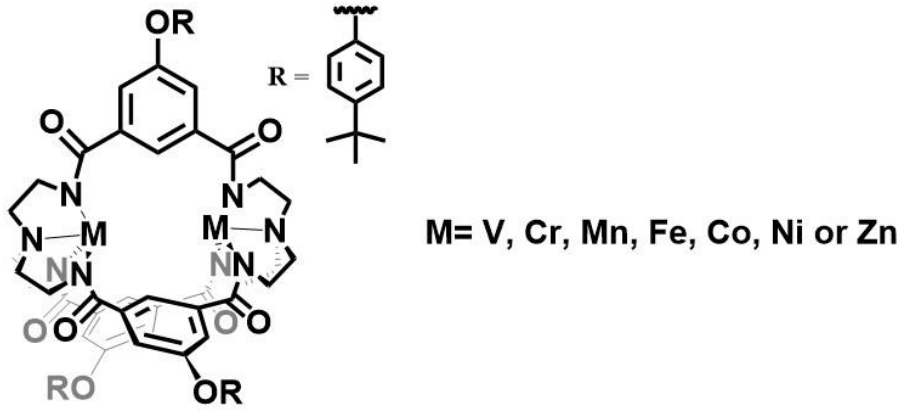
Characterizing the Products





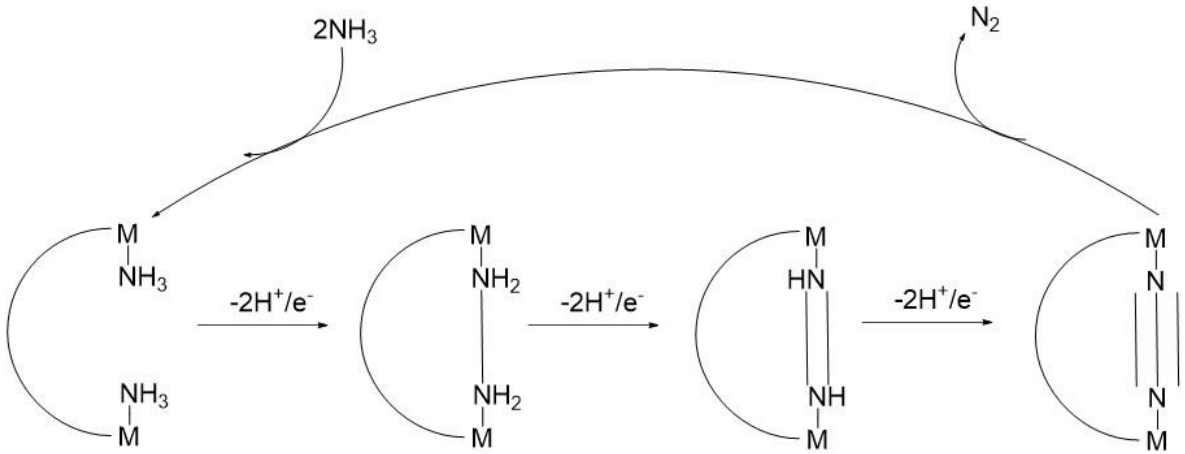
Moving Forward

Our end product



M= V, Cr, Mn, Fe, Co, Ni or Zn

Long term goal



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