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**Journal Article Discussion**

Sampson, M. D.; Nguyen, A. D.; Grice, K. A.; Moore, C. E.; Rheingold, A. L.; Kubiak, C. P. “Manganese Catalysts with Bulky Bipyridine Ligands for the Electrocatalytic Reduction of Carbon Dioxide: Eliminating Dimerization and Altering Catalysis”, *JACS* **2014**, *136*, 5460-5471.

**Learning Objectives**

1. Identify the structure of a research article.
2. Summarize the motivation and major goals of a study.
3. Recognize the central reaction and catalyst of a paper.
4. Analyze a catalytic cycle.
5. Explain how particular conclusions were determined based on experimental data.
6. Recognize applications of the techniques presented in the paper.

**Literature Discussion Questions**

1. Identify and describe each of the major sections within this research article.
2. Is there anything that you think is unusual about the order of the sections?
3. The term “vide infra” appears often throughout the paper. What does this term mean? How is it used in the context of this scientific paper?
4. Summarize the goal of this article. Describe the broader motivation for this research.
5. Write the reaction being catalyzed.
6. Define a catalyst. Identify and draw the catalyst in this paper.
7. Define the term “dimers” and discuss their significance in this paper.
8. What were the potential advantages of using a Mn catalyst both in terms of practicality and performance?
9. What data did the authors use to support their claim that the singly- and doubly-reduced complexes, **3** and **4**, were produced during the reduction of complex **1**?
10. How did the authors determine that the reversible reduction wave corresponded to two single-electron reductions instead of one two-electron reduction?
11. What were the reaction conditions for the catalysis of CO2 reduction by the Mn catalysts in this paper? Give concentrations when applicable.
12. Identify and describe the control experiments within this article. What did the authors learn from each of these experiments?
13. Identify the oxidation state, electron count, coordination number, and geometry of each Mn species in the catalytic cycle.
14. Classify each step within the catalytic cycle (i.e. reduction, addition, oxidation, dimerization, substitution, elimination, etc…).
15. Articulate the major conclusions of this study. Did the authors achieve their goals?