**Synthesis and Characterization of Aluminum Complexes of Redox-Active Pyridyl Nitroxide Ligands**

Please complete these guiding questions to *Inorganic Chemistry* **2015**, *54*, 10901-10908. <https://doi.org/10.1021/acs.inorgchem.5b01941>

1. According to the introduction, why are redox-active ligand aluminum complexes of interest?

2. Draw the structure of ligands 2,2’-bipyridine and a-diimine, two of the ligands mentioned in the introduction. Circle the atom(s) that interact with the metal center. Why are these ligands designated as chelating?



3. Using Figure 1 and Scheme 1 as references, draw the pyridyl nitroxide ligand in its three different oxidation states.

|  |  |  |
| --- | --- | --- |
|  |  |  |
| pyNO¯ | pyNO0 | pyNO+ |

4. (a) Write the electron configuration of Al and Al3+. Designate each species as being diamagnetic or paramagnetic

(b) Use the covalent bond classification (CBC) method to fill in the table below for the ***anionic*** form of pyridyl nitroxide Al complex (**1**).

|  |  |
| --- | --- |
|  | (pyNO−)2AlCl (**1**) |
| pyridyl CBC ligand classification |  |
| NO of pyridyl ligand CBC ligand classification |  |
| Cl ligand classification |  |
| MLlXxZz classification |  |
| Valence number |  |
| Ligand bond number |  |

5. On page 10903, the authors describe compound **1** as having a “distorted square pyramidal geometry.”

(a) Give the ideal bond angles for a compound with a square pyramidal structure. Cite data from Table 2 to support that compound **1** has a distorted square pyramidal geometry.

(b) Based upon the 1H and 13C NMR data as well as the crystal structures of **1**, what point group did the authors assign the compound?

6. How did the authors utilize DFT calculations to support the other results in the article?

7. What was the authors’ interpretation of the CV of compound **1** in Figure 9?

8. Why did the authors cite reference 10?