**Deca-Arylsamarocene: An Unusually Inert Sm(II) Sandwich Complex**

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*Organometallics* **2018**, *37*, 2263−2271

DOI: 10.1021/acs.organomet.8b00254

**Discussion**

1. What is the main objective of this paper?
2. Consider the structures of Cp\*2Sm and deca-arylsamarocene complexes.
   1. What was the motivation for introducing bulky aryl substituents on the Cp rings?
   2. What was the motivation for adding alkyl groups to the aryl substituents on the Cp rings?
   3. What was the motivation for introducing new alkyl groups to the aryl substituents on the Cp rings?
3. Consider the preparation of deca-arylsamarocene complexes reported in this article, and illustrated in Scheme 2 for CpAr-Bu2Sm. Use the Covalent Bond Classification (CBC) method to assign ligand functions (X, L, Z) and justify the valence number (VN) and/or oxidation state of Sm in each of the complexes shown (precursors and product).
4. Why do the authors describe the CpAr-Et2Sm complex (**1**) as centrosymmetric (Figure 1)?
5. Contrast the reactivity of deca-arylsamarocene complexes investigated in this article to that of Cp\*2Sm (Scheme 1). What characteristics of deca-arylsamarocene complexes contribute to their lack of reactivity?
6. Consider the reaction of CpAr-Et2Sm (**1**) with cuminil leading to the formation of complex **3** (Scheme 3).
   1. What information about the cuminil ligand in complex **3** did the authors extract from its crystal structure (Figure 2c)?
   2. Use the Covalent Bond Classification (CBC) method to assign ligand functions (X, L, Z) to the cuminil ligand in complex **3**.
   3. Use the Covalent Bond Classification (CBC) method to assign all ligand functions (X, L, Z) and justify the valence number (VN) and/or oxidation state of Sm in complex **3**.
   4. Use the Covalent Bond Classification (CBC) method to determine the ligand bond number (LBN) for Sm in complex **3.**
7. What structural similarities did the authors find between complex **3** and the (Ph5C5)2W = 0 complex described on page 2267?
8. Consider the reaction of CpAr-iPr2Sm (**2**) with phenazine in the presence of O2 that leads to the formation of complex **4** (Scheme 3).
   1. How did the authors assign the bridging “O2” ligands as bridging peroxo ligands (O22-)?
   2. One of the possible binding modes for a bridging peroxo ligand is “side-on/side-on”. Use the Covalent Bond Classification (CBC) method to assign ligand functions (X, L, Z) to each peroxo ligand in complex **4,** if we assume a “side-on/side-on” configuration**.**



* 1. What information about the phenazine ligand in complex **4** did the authors extract from its crystal structure (Figure 3b)?
  2. Use the Covalent Bond Classification (CBC) method to assign ligand functions (X, L, Z) to the phenazine ligand in complex **4**.
  3. Use the Covalent Bond Classification (CBC) method to assign all ligand functions (X, L, Z) and justify the valence number (VN) and/or oxidation state of each Sm in complex **4**.
  4. Use the Covalent Bond Classification (CBC) method to determine the ligand bond number (LBN) for each Sm in complex **4.**