**Learning Goals**

**Students should be able to:**

• Explain the t4 parameter and how it is used in coordination chemistry

• Rationalize observations in experimental data (IR spectroscopy, X-ray crystallography, magnetic measurements, cyclic voltammetry)

• Define redox non-innocence and show its prevalence in applications in chemistry

• Use CBC methods to determine the EN, LBN, VN, and dn

• Apply concepts of green chemistry principles to article

**Synthesis and electronic properties of transition metal complexes containing sulfonamidoquinoline ligands**

Gole, M. T.; Pauls, P.; Hartlaub, S.; Nataro, C.; Rossiter, L. M.; O’Connor, A. R.; Chan, B. C. *Polyhedron* **2021**, *205*, 115269.

This Learning Object is dedicated to Prof. Chan as part of the VIPEr LGBQTIAN+ LO collection created in celebration of Pride Month (June) 2022. A profile of Prof. Chan from the *Chemical & Engineering News* Out and Proud article can be found at

<https://cen.acs.org/careers/diversity/LGBTQ-diversity-Trailblazers-2022/100/i12>.

Read the article written by Dr. Chan and coworkers *Polyhedron* **2021**, *205*, 115269. You may need to use outside resources to answer these questions. Please cite those resources near the answer to the question.

1. Why is studying the structure and properties of sulfonamidoquinoline ligands and their metal complexes of importance?
2. Draw out the monoanionic version of the sulfonamidoquinoline bidentate ligand. Circle the two binding sites on the drawing.
3. What properties do metal complexes that contain sulfonamidoquinoline ligands possess and what applications exists for these complexes?
4. What is meant by redox active ligand? Describe how redox active ligands have been used in applications.
5. Looking at the green chemistry principles what aspects of this work do you find support the principles outlined at this [website](https://www.acs.org/content/acs/en/greenchemistry/principles/12-principles-of-green-chemistry.html#:~:text=One%20of%20the%20key%20principles,is%20the%20use%20of%20enzymes.)?
6. How did the authors use IR spectroscopy as a tool to confirm that the ligand coordinated to each metal center?
7. Using covalent bond classification (CBC) assign each ligand as L, X, or Z and then determine the EN, VN, LBN, and dn for complexes 1-NO2, **2**, **3**, and **4**. Show your work for credit.
8. What does the t4 parameter measure and thus allow researchers to compare?
9. Looking at the bond distances listed in Table 1 for **1-NO2**, **2**, and **4** rationalize the observation of the M-pyridine N bond distance are longer than the M-sulfonamide N bond distances.
10. Propose a reason why in the nickel complex **3** the pyridine N to nickel bond distances are shorter vs the nickel to sulfonamide N bond distances.
11. Show how the experimentally determined meff of 3.04 BM for complex supports a high spin d7 Co+2 center vs a low spin d7 Co+2 center. (Hint\*\* Start by thinking about the different geometries predicted for ML4 complexes)
12. Two different methods were used to determine the magnetic moments of the copper complexes. What were those two methods? Compare and contrast them.
13. What was discovered by the authors when they determined the meff value for **1-NO2** in the solid state vs solution phase and then compared it to ms for Cu+2?
14. What experimental findings were collected by the authors to support that the sulfonamidoquinoline ligand with a nitro group could be redox non-innocent?
15. Summarize in your own words the key finding in this paper and how this could advance chemistry in coordination chemistry.

Self-Reflection:

What areas of this assignment were you able to answer without help from your notes?

What concepts highlighted in this assignment do you need to review?

How did you feel about this assignment? (what was challenging, what was easy)