

Dealing with heavy-chalcogen chemistry: zwitterions, clusters and some applications

Sailer S. dos Santos

Universidade Federal de Santa Maria, Santa Maria - RS, Brazil

*e-mail: sailer.santos@ufsm.br

Heavy-chalcogen (Se and Te) based molecules are quite useful building blocks in synthetic chemistry because of the sort of molecular structures found in these compounds – organochalcogen halides are classical examples (Figure 1).

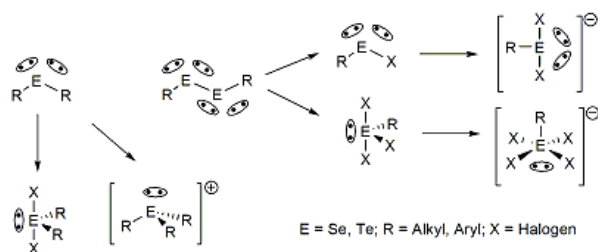


Figure 1. Common molecular shapes for chalcogen derivatives.

We have interest in the structural chemistry of organochalcogen halides (REX_n) in which R groups have at least one σ -donor atom, such as pyridyl groups. With this kind of starting materials, we can develop simple molecules, metal complexes and even zwitterionic compounds.¹ Figure 2 illustrates some synthetic possibilities starting from bis(2-pyridyl)ditellane.

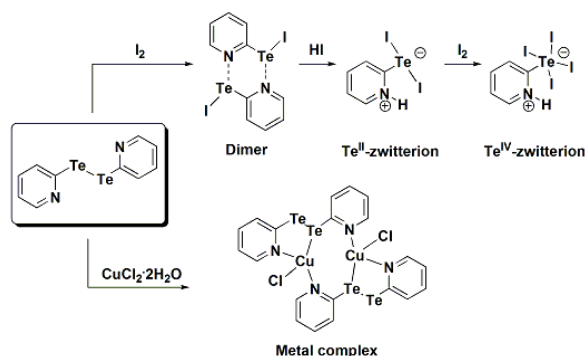


Figure 2. Some compounds prepared from bis(2-pyridyl)ditellane.

In addition, Se and Te exhibit multiple coordination modes to metals and can act as

connectors for building multi-centered structures (Figure 3).

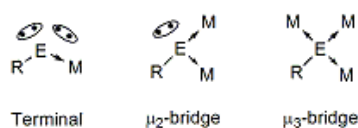


Figure 3. Coordination modes for metal organochalcogenolates.

Combining metal organochalcogenolates, $\text{M}(\text{ER})_n$, with metal halides or metal complexes, we can generate *in situ* the intermediary reactive species “REM_X” that can aggregate in solution to form chalcogen-rich metal clusters (Figure 4).²

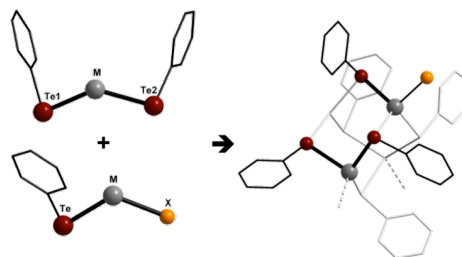


Figure 4. Schematic representation for the aggregation of metal organochalcogenolate units to the production of clusters (M = Cu, Zn, Cd, Hg, In, Sn, Pd).

These clusters have a chalcogen-metal core that can provide semiconductor properties, and we are interested in applying these compounds to water-splitting and dihydrogen production from solar energy.³

1. dos Santos, S. S.; Cabral, B. N.; Abram, U.; Lang, E. S.; *J. Organomet. Chem.* **2013**, 723, 115.
2. Lang, E. S. et al., *Inorg. Chem.* **2007**, 46, 2356
3. Tirloni, B.; Lang, E. S.; Silva, P. M.; Dupont, J. : **2012**, PI0118564.

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